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Southland Paper Mills, Inc. Make First Paper

New Mill At Lufkin, Tex., Makes First Newsprint From Southern Pine On Wednesday, January 17—First Product Is Very Satisfactory and Plant Will Be Turning Out 150 Tons Daily When Capacity Is Reached Soon.

LUFKIN, Tex., January 20, 1940—What was considered as fine a roll of newsprint as any ever made on the North American Continent became a reality at 9:35 A.M. on Wednesday of last week at the new plant of the Southland Paper Mills, Inc., according to Victor H. Schoffelmayer, agricultural editor of the *Dallas Morning News*. The operation began at 4 A.M., with practically all of the paper machine crew on hand to see the attainment of a goal which had been envisioned by the late Dr. Charles H. Herty, research chemist and paper technician, who first called attention of the nation to the South's great possibilities as a center of paper production.

History Being Made

The comparatively small group which witnessed the process realized that history was being made whose consequences at this time could not be guessed. They may bring to East Texas and the South a great paper industry and other related chemurgic enterprises which will give employment to thousands of farmers in factory, field and forest and bring prosperity to a region suffering from lost cotton income.

Executives present Wednesday morning, after a night of watchful waiting, were Ernest L. Kurth, president of Southland; Albert Newcombe, George Newcombe and Tom A. Wark, general manager, and several of the executives' wives.

A great shout drowned out the roar of the 325-foot paper machine on its first commercial run as the gleaming white sheet, traveling at the rate of 600 feet a minute and 19½ feet wide, wound itself on the finished roll.

No Pitch Trouble

There had been necessary no more than the usual adjustment in any new paper mill, Mr. Newcombe said, merely a matter of getting the right proportions of pulp working together smoothly. There was absolutely no pitch trouble at any time, although wood all the way from five and six inches in diameter to twenty-one inches was ground up during the operation. The mill is obtaining contract wood four feet long at $4.25 a cord.

"We hope to get into continuous commercial production by week end or soon thereafter," Mr. Kurth said. "The paper we have made so far is in every way suitable for delivery. We are certainly happy and proud over the result."

There is a keen scramble among Texas, Oklahoma, Arkansas and Louisiana daily newspaper publishers, who subscribed to taking their share of the mill's 150 tons of paper a day, to obtain prompt deliveries of this new pine paper by next week. It is likely that the mill will be operating in four shifts on a twenty-four-hour-a-day basis and turning out at capacity.

Mr. Newcombe Expresses Satisfaction

"We are impressed mostly with the cleanliness of the newsprint made from East Texas loblolly and shortleaf pines," Mr. Newcombe said. "Nothing cleaner has ever come to my notice. The character of the sheet has every desirable feature as to strength. It is eminently satisfactory. Of course, it may be a week or ten days before all the kinks in operation have been ironed out, because you must remember that this is an entirely new thing, never done on a commercial scale before. We will add refinements as we go and in a short time the paper made from Southland Paper Mills will be the equal of any ever made in every way. Up till now we have not put into operation our dandy or shake equipment, which will add greatly to the finish of the sheet. In every way we are delighted."

Several Records Have Been Set

Several records have been set by Southland Paper Mills, one being the rapidity of completing the $6,000,000 mill from ground breaking last January and the first construction work, which started last March 25. The plant was taken over as completed from the Merritt-Chapman-Scott Corporation, which built it, last Monday. Ideal conditions have prevailed throughout most of its erection. Offers of pulpwood from as far away as Texarkana merely show what a vast area is ready to serve the plant with native pine. Most of the wood comes from within ten to twenty miles of Herty.

From Champion Fiber and Paper Company, Houston, the necessary semibleached pulp is coming steadily. Of this chemical pulp, about 20 per cent is mixed with the mill's own ground wood produced on its six huge Great Northern grinders, which now are ready to enter upon full operation. The automatic

(Continued on page 22)

Marathon Mills Develops New By-Products

Utilization of Solids In Sulphite Liquor Waste By Marathon Paper Mills Co. Affiliate Promises To Become Large Enterprise—E. C. Hilfert Heads Paper Group — Paper Credit Unions Meet — Other News.

[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., January 22, 1940—Utilizing solids in sulphite liquor waste for by-products is becoming an industry of considerable size at the Marathon Paper Mills Company, Rothschild, Wis., and bids fair to grow into a gigantic enterprise as processes and products are further developed.

This trend was revealed by L. F. V. Drake, president of the Salvo Chemical Company, affiliated with the Marathon Mills, and organized sometime ago to reclaim sulphite waste. Although ninety tons are being reclaimed daily, only ten tons are used for manufacture at the present time.

The two products on which the company is concentrating are vanillin and plastics. Chemical explorations reveal the sponsors of this new industry are on the verge of achievements rivalling the coal tar industry, Mr. Drake says, and the present chemical development, he believes, is unexceeded in the United States.

Rothschild Plant Large Vanillin Producer

The Rothschild plant now produces fifty per cent of the vanillin used in the country. The demand has been such that a 30 per cent expansion was necessary during the last year. Orders have at times exceeded the supply, reducing inventories to approximately the zero mark. Construction carried on thus far to provide the necessary plant facilities has reached nearly $200,000.

Manufacture of plastics is a more recent development, but the aim is to produce for big tonnage users so as to avoid competition with the general plastics field. Plastics can be produced, it is said, that have the weight and strength of steel, used extensively by the motor car industry and others.

E. C. Hilfert Heads Paper Group

E. C. Hilfert, secretary-treasurer and general manager of the Riverside Paper Corporation, Appleton, Wis., was elected president of the Wisconsin Paper Group at the annual meeting January 13, succeeding W. K. Gerbrick, president of Central Paper Company, Menasha, who automatically remains a member of the board of directors for one year. The meeting was held in connection with a luncheon at Valley Inn, Neenah, Wis.

Other officers chosen are: W. K. Austin, Kimberly-Clark Corporation, vice-president; L. O. Schubart, Neenah Paper Company, secretary-treasurer. Irwin Pearson, executive secretary for the last six years, was retained in that capacity.

New members elected to the board of directors are: A. C. Remley, Nekoosa-Edwards Paper Company; Elmer Jennings, vice-president of Thilmany Pulp and Paper Company; A. J. Schierl, Whiting-Plover Paper Company; and Leonard Kuehl, Flambeau Paper Company, Park Falls, Wis. They succeed: N. H. Bergstrom, Bergstrom Paper Company; R. F. Bellack, Fox River Paper Corporation; W. A. Munroe, Flambeau Paper Company, and R. M. Sensenbrenner, George A. Whiting Paper Company.

Directors retained are: C. W. Hoeper, Badge Paper Mills, Inc.; H. D. Wake, Consolidated Water Power and Paper Company, and R. J. Sund, Menasha Products division, Marathon Paper Mills Company.

Reports were submitted by Mr. Schubart, on the financial operations; Henry C. Krueger, Neenah, Wis., chairman of the traffic committee; Gene Colvin, Appleton Coated Paper Company, Appleton, Wis., chairman of the advertising committee, and Mr. Pearson, on operations for the last year.

There are 28 member mills in the group, a non-profit organization with offices at Neenah for the assembling of less than carload shipments for pool cars to various jobber territories in order to provide carload rates.

Court Permits Sale of Cellucotton Stock

Permission was given by Judge D. E. McDonald of the probate court at Oshkosh, Wis., to the First Trust Company of Oshkosh, to sell 250 shares of International Cellucotton Corporation stock from a trust fund established in 1935 for Mrs. Harriet Price Gunn of Chicago. The fund was established by the late Harry Price of Kimberly-Clark Corporation, Neenah, Wis. He was the grandfather of Mrs. Gunn, and the fund was made up of $80,000 in shares of International Cellucotton and Kimberly-Clark Corporation stock. Remaining in the fund are 674 shares of International and 602 shares of Kimberly-Clark.

Paper Mill Credit Unions Meet

Annual meetings of several credit unions among paper mill employees were held last week. Nearly 700 employees of the Marathon Paper Mills Company's credit union at Rothschild, Wis., are active members, with Norman Dumdei as president. A healthy growth was enjoyed during the last year.

At the Menasha Products division of Marathon Mills at Menasha, Wis., credit union members voted to sponsor a dancing party for themselves and families on or about February 3, to mark formal dedication of the company's newly constructed plant. Hugh Geibel was reelected president.

Bull's Eye Credit Union of Consolidated Water Power and Paper Company, Wisconsin Rapids, Wis., accepted 219 new members during the last year, bringing the total to 932. The union granted 633 loans totalling $69,164 during 1939, and declared a dividend of 4.8 per cent. Lawrence Villeneuve was elected president.

Thilmany Employes Association also held its annual meeting last week. It is made up of employes and executives of the Thilmany Pulp and Paper Company, Kaukauna, Wis. William Gillen was elected president, L. C. Smith, personnel director, as secretary, William Voie as assistant secretary, and Myron T. Ray, secretary-treasurer of the company, as treasurer.

Special Body Studies Canadian Forests

At Session of Special Committee Investigating Lands and Forests In Ontario Province Col. Drew Suggested United States Pulpwood Importers Be Asked To Testify — Consolidated Co. Large Importer of Pulpwood.

[FROM OUR REGULAR CORRESPONDENT]

TORONTO, Ont., January 22, 1940—At a sitting of the special committee investigating the lands and forests department of the province of Ontario, Col. G. A. Drew, Conservative leader in the Legislature, suggested that United States importers of pulpwood from Ontario should be asked to testify before the committee. He will urge that they be formally requested to come. Hon. Peter Heenan, Minister of Lands and Forests, was queried by Col. Drew if he knew what percentage of Ontario pulpwood imported into the United States was processed into newsprint. Mr. Heenan offered the suggestion that he had no doubt United States operators would be willing to come to testify.

Walter C. Cain, deputy minister of Lands and Forests, a witness at the second sitting of the committee, admitted that the method of cutting on some privately owned areas had had disastrous results and that in the broader public interest it would be better to have some control. He added that no new pulp or paper mills had come into operation in the province since 1936 except the Lake Sulphite Company at Red Rock which did not come into operation.

Difficult to Trace Consumption of Wood

Col. Drew attempted to trace the course of export wood from Canadian ports to its point of consumption but Hon. Mr. Heenan said that it was not possible to do so accurately as the province of Ontario had no exact figures on the operation of American mills. None of the wood, Mr. Heenan insisted, was used in the manufacture of newsprint.

Col. Drew inquired if it was not correct that some of the companies importing wood from Ontario were also making newsprint in other places. Mr. Heenan said that he could not say for certain as such records were not kept. Col. Drew said that he understood from Mr. Heenan that the wood imported from Ontario did not compete with Canadian wood on the market and was not used for the manufacture of newsprint. He added that there was nothing to show that the wood once received from the United States was not trans-shipped to a subsidiary company and used in a newsprint mill.

Col. Drew thought the best way to settle this point would be by direct evidence. Mr. Heenan remarked that Ontario could not very well subpoena United States operators to appear before the committee but he thought they would be willing to come voluntarily if requested.

Col. Drew replied that they should be as the various nature of their business makes harmonious relations with the Ontario government imperative. He agreed that their testimony would do more to clarify the situation than any indirect evidence.

Peak Pulpwood Production in 1937

In regard to pulpwood, Mr. Heenan said that the peak year in the industry, in the Thunder Bay District was in 1937. In that year three companies used 425,715 cords of wood. The permissible cut from all lands, both crown and private, in the districts accessible to water, was said to be 740,000 cords of spruce and balsam. It was pointed out that 15 per cent of the cut was poplar, which is not included in the total set as the permissible cut. The figures of the Department of Lands and Forests show that in 1938, 613,000 cords of pulpwood were cut from crown and private lands in the Thunder Bay District, and in 1939—43,131 cords. The cut in 1939 was valued at $3,516,942.

Mr. Heenan said that one object in permitting pulpwood to be exported was that there was a large amount of matured timber that should have been cut anyway.

After hearing from delegations, Mr. Heenan stated the Ontario Government passed an order to permit men to cut for one year, and permission was to be extended from year to year. The Thunder Bay limits had been opened up to relieve a serious unemployment situation at the Head of the Lakes. While the Government had no set policy in regard to the keeping open of limits, they will likely do so until the employment situation gets better.

Colonel Drew, opposition leader, asked Mr. Heenan if it was not correct that some companies are importing Ontario pulpwood into the United States through subsidiaries making newsprint in other places? Mr. Heenan admitted that some raw material might be used in subsidiaries. Asked what control there was over them, Mr. Heenan replied "None, except affidavits from Canadians that the wood would not be used in pulpwood mills."

Consolidated Large Pulpwood Importer

Mr. Heenan said that the largest importer of Ontario pulpwood from the Thunder Bay district was the Consolidated Water and Power Company, of Appleton, Wis. The company took 131,000 cords last year from all sources. The Appleton mills were working overtime and so are the mills operating in Ontario using the same kind of wood. Colonel Drew declared that he was concerned with the fact that 612,000 cords of Ontario resources are being exported to the United States. He thought it would be wise to limit the exports so that Ontario could get more pulp manufactured in the province. He wanted to know what steps were being taken in that direction.

Advocates Research Activity

Before the special legislation committee, Col. Drew, Conservative leader, advocated a research committee or board to find new uses for timber products. This suggestion was concurred in by Walter C. Cain, deputy minister of lands and forests for Ontario. It was stated that Sweden, next to Canada the largest exporter of timber products in the world, has a research institute to look into and advise on the utilization of forest products.

Chicago Reports Wholesale Prices Steady

Expected Improvement In Midwest Paper Market Has Not Yet Appeared Though Market Is Strong and Prices Firm — Midwest Salesmen Take Up Bowling — Wall Paper Up 31 Per Cent In Six Months.

[FROM OUR REGULAR CORRESPONDENT]

CHICAGO, Ill., January 22, 1940—Expected improvement in the Chicago paper market has as yet failed to materialize though prices continue to be very steady and the underlying structure strong. According to local reports paper is simply not moving from the merchant shelves and printers are finding general business rather loath to speed up activity. Excuses given range from war uncertainties to the extreme political nature of the entire year plus the possible conclusions of the Federal Congress. All lines are reported to be sharing in this immediate "marking time". Waste papers have likewise relapsed into the "easy" classification and are now in line with the Eastern situation in general according to local reports. Supply is plentiful and demand is not as heavy as formerly. Krafts continue in fair demand and inquiries are numerous in virtually all lines including groundwoods, sulphites, books and covers. Local market prognosticators simply feel that business will have to have a slight upturn to force renewed realization of the general scarcity in the paper market.

Salesmen Take Up Bowling

The midwest division of the Salesmen's Association of the Paper Industry has added bowling to its list of sports. Just as golf did yeoman service in creating a better feeling between the sales executives of the city, bowling is likewise being credited as another factor in developing this type of good will relationship. For the past three weeks an average of twenty-five salesmen have been hitting the maples on a Wabash Avenue alley, congregating at 1:30 p.m. each Saturday. No teams have been made up owing to the late start made but there is plenty of competition provided for. The activity is under the chairmanship of Rondo Warner of the Minnesota and Ontario Paper Company and he announces that all are welcome to participate. At the rate the activity is increasing in popularity it seems as though bowling would become a specific sport for the Salesmen's Association with team competition a characteristic of the 1941 schedule. We've no report as yet as to who the "crack" bowlers are. After all, say the local satellites, the boys are "still practicing".

Wallpaper Orders Up 31 Per Cent

Wallpaper orders of United Wall Paper Factories, Inc., for the six months ending December 31 amounted to 59,977,555 rolls according to A. J. Browning, president. This is an increase of 31 per cent over the corresponding period of 1938 when orders totaled 45,941,776 rolls. December orders were for 9,301,000 rolls as compared to 2,765,742 rolls in December of 1938. The market increase in demand, according to Mr. Browning, can be attributed to increasing consumer acceptance for interior decoration, the introduction of improved methods for manufacturing and "some buying in anticipation of a price increase".

C. A. Babcock Dead

Charles A. Babcock, president and treasurer of the Wisconsin River Paper and Pulp Company, died at his home at Neenah, Wis., Friday evening, January 19. He had suffered a heart attack the previous day.

Mr. Babcock, 71 years old, was born November 21, 1868 at Kaukauna, Wis., and was first employed at that city by the Union Bag and Paper Company. He moved to Neenah in 1889, and was associated with the Whiting-Plover Paper Company and the Wisconsin River Paper and Pulp Company. In 1911 he acquired the controlling interest in the latter concern, which has its mill at Stevens Point. He disposed of his interest in Whiting-Plover, and was president and treasurer of the Wisconsin River concern until his death.

In 1905 Mr. Babcock was elected a director of the First National Bank of Neenah, and became its vice-president in 1920, an office he has held ever since. He was reelected at the bank's annual meeting this month. He was also vice-president of the Merchants and Manufacturers Hotel Association which operates the Valley Inn at Neenah, and was president of the North Shore Golf Club. He was a member for 49 years of Elisha Kent Lodge No. 61 of the Masonic order, a member of the Chicago Club, and chairman of the board of trustees of Valley Council, Boy Scouts of America.

Survivors are a daughter, Mrs. K. B. Mory of Neenah, and a brother, Guy O. Babcock, Wisconsin Rapids, Wis.

Funeral services were held at the residence Sunday afternoon, January 21, with the Rev. A. A. Chambers, rector of St. Thomas' Episcopal Church in charge. Burial was made in Oak Hill cemetery at Neenah.

Godwin Goes With Ontario Paper Co.

[FROM OUR REGULAR CORRESPONDENT]

VANCOUVER, B. C., January 30, 1940—Gordon Godwin, expert on tractor logging, has left British Columbia to accept a post as tractor engineer with the Ontario Paper Company. Mr. Godwin has recently been engaged in extensive research work on tractor logging at headquarters of the British Columbia Forestry branch in Victoria. His practical experience in the tractor logging field, however, has been gained in widely separate parts of the North American continent.

In his new post, Mr. Godwin's chief duties will be to develop means of bringing tractor logging for pulp purposes into lines economically with hand labor methods used in that territory.

Paper & Cordage Association Adds Members

Many Representatives of Mills and Converting Plants Attend Meeting of Philadelphia Paper & Cordage Association — Paper Houses Admitted To Membership — Garrett-Buchanan Co. Hold Election — Other News.

[FROM OUR REGULAR CORRESPONDENT]

PHILADELPHIA, Pa., January 22, 1940—The Philadelphia Paper and Cordage Association, held its first meeting of the year on Friday January 19 in the Arcadia Restaurant, with president George K. Hooper presiding. Despite the inclement weather, there was an overflow attendance of members of the paper houses together with many mill men and converters.

Immediate past president, Jack Howarth, was presented with a pen desk set, on which was fastened a plaque fittingly inscribed recognition of the splendid service he rendered to the Association during his presidency. In accepting the gift, Mr. Howarth said that his year as president was one of the most pleasant of his life and one of the most profitable in that he made many new friends and got to know his old friends better.

In addressing those present, president Hooper exhorted the chairmen of the various committees to organize their activities immediately, keeping in mind the slogan of the Association, namely: "To promote good fellowship in the paper and cordage industry and to encourage the interchange of business among the members."

Paper Houses Admitted to Membership

The following were admitted to membership: Cole Specialty Envelope Company, 5219 Filbert street, makers of envelopes and specialties; Better Packages, Inc., 401 N. Third street, distributors of gummed tape and sealing machines; Ridgewood Paper Company, 924 Cherry street, paper jobbers, and Simon Miller Sales Company, 1201 Chestnut st., mill representatives. The application of The Independent Twine and Yarn Company, 9 North 5th street, will be acted upon at the next meeting of the Association, which will take place on February 15.

Jack Shinners, newly elected chairman of the Entertainment Committee, is already at work on a program for the annual shad dinner, to be held some time in March. E. L. Richards, who was re-elected chairman of the golf committee, has already started enrolling members for this year's tournaments which, as in previous years, will be held at the various outstanding Country Clubs in the Philadelphia area.

Garrett-Buchanan Elect Officers

The annual election of Garrett-Buchanan Company took place on January 9th, resulting as follows: President, Morgan H. Thomas; Vice-president and manager, G. W. Weaver; Vice-president and assistant manager, F. H. Seltzer; Vice-presidents:—E. J. Beale, J. F. Green, J. S. Weaver, J. S. Heberly, C. R. Smith and A. K. Thomas; Treasurer, J. E. Thomas; Assistant treasurers—J. R. Kohl and W. H. Van Aiken; Secretary, J. H. Miller. Directors: M. H. Thomas, G. W. Weaver, J. L. Thomas, C. R. Smith and A. K. Thomas.

A gala event in the history of Garrett-Buchanan Company was staged on Friday evening last, when all the executives and employees, including the elevator operators, truck drivers and porters from their three houses, Philadelphia, Baltimore and Van Reed Paper Company of Reading, Pa., assembled at dinner in the headquarters of McAllister's, 1811 Spring Garden street. George W. Weaver, vice-president and manager, with his bland humor and seraphic smile, did an excellent job as master of ceremonies. Rev. Walter Bruggerman made the invocation, and, in a short address, stressed the value of cooperation among employees. President Morgan H. Thomas, in his talk said that he felt singly honored at this brilliant get-together party inasmuch as a similar party held at this time last year commemorated his association for forty years with the Garrett-Buchanan Company and was so highly enjoyable that it was decided to repeat it this year. Mr. Thomas added however that a tinge of sorrow pervaded the gathering this year because of the fact that his very close friend, Alexander Thomson, who was chairman of the board of Champion Paper and Fibre Company of Hamilton, Ohio, and his guest last year, had passed on to his reward during the year, and as a tribute to his memory all those present stood in silent prayer for some few minutes. Charles Labor, Philadelphia representative of the Champion Paper & Fibre Company, was the honored guest.

Fred Brower Issues Another Edition

Frederick I. Brower, Philadelphia representative of Atlantic Gummed Paper Corp., is on the firing line again with another edition of "News 'n Nonsense", the official publication of the Philadelphia Paper and Cordage Association. Fred did such a good job with this breezy little sheet last year that he was prevailed upon by the new administration to resume publication this year.

Paper Man at Realty Board Banquet

Norbert A. Considine, president, Paper House of Pennsylvania, and former Consul to Finland, was a guest at the annual banquet of the Philadelphia Real Estate Board, held in the Bellevue-Stratford on Saturday evening last, at which the guest of honor was Hon. Hjalmar J. Procope, Finland's Minister to the United States.

Packaging Exposition March 26-29

Alvin E. Dodd, president of the American Management Association, announced this week the tentative program of the 10th Conference on Packaging, Packing and Shipping to be held concurrently with the 10th Packaging Exposition at the Hotel Astor New York City March 26 to 29 under the sponsorship of the association.

The program will include W. B. Lincoln Jr., development engineer of the Inland Container Corporation, who will discuss interior packing for shipping and G. T. Henderson of the Hinde & Dauch Paper Company, who will talk on the technical aspects of board manufacture.

Modernization of Sectional Drive Speeds Paper Production 32 Per Cent

By A. V. Burbage[1]

In 3½ days the Albemarle Chesapeake Company completely revised and modernized the sectional electric paper-mill drive in its West Point, Va., plant, and thereby increased production by 32 per cent. When the mill went into operation in 1930 the 240-inch 150-ton Pusey & Jones Fourdrinier paper machine was driven by a Westinghouse variable-voltage sectional electric drive, designed for an operating range of from 100 to 850 feet per minute.

At that time a 500-kw 600-volt d-c running generator and 1600-ampere (momentary rating) starting generator powered by a 750-horsepower, 2300-volt synchronous motor formed a three-unit coupled set on a common bedplate. Master frequency control and excitation were secured from individual motor generator sets. Carbon pile regulators were used for both voltage regulation and sectional speed regulation. The nine paper-machine sections were driven by individual 600-volt d-c motors through speed reducers. In 1935 an additional section of 12 dryers was installed which was geared to present gear train and driven by a 70-horsepower motor.

This additional drying capacity together with other improvements on the paper machine increased the output to approximately 170 per cent of the initial capacity. Due to the increasing number of runs at 850 fpm on nine point paper it was proposed, early this year, to step the paper speed up to 1050 fpm representing an additional 32 per cent increase in production on nine point paper. Present driers were adequate for this weight paper at the higher speed. It was decided however, that a future addition of 16 driers should be considered in any revamping study. This would permit increased production on Paper Board, should future markets dictate more board and less light weight paper.

Engineering Approach

Three methods were considered in approaching this problem of increased paper speed: 1. By weakening the section motor fields. 2. By increasing running generator voltage. 3. By changing gear ratios of speed reducers.

The design of the section motors indicated that mechanically they would stand speeding up. However, commutator speeds not conducive to recognized good engineering practice would be encountered with the probable result of poor commutation, excessive maintenance and reduced safety factor. For this reason methods 1 and 2 were discarded and the third method of decreasing gear ratios was selected. This method presented problems of increased loads and higher starting torques.

Utilized Most of Present Equipment

Economically, it was fundamentally wrong to scrap a very satisfactory drive that had given years of excellent service, so a thorough investigation of each piece of equipment was made with a view towards revamping or modifying to meet the changed conditions.

As the paper machine was satisfactory for operation up to 1100 fpm without major expenditures on anti-friction bearings or balancing, this maximum speed was decided upon. By decreasing the gear ratios to obtain 1100 fpm the loading on the section motors and generator equipment increased in direct proportion to the increase in speed—a ratio of 1100/850 or approximately 30 per cent. Somewhat higher loading would be expected on the couch due to increased vacuum required to remove water at the higher speeds. A daily log record for the past nine years was available for all motor and generator loads for various speeds, and paper weights. The design of the section motors indicated adequate capacity for the increased power requirements at increased speeds provided the machine was operated so that it did not require any higher horsepower per foot per minute of paper than it did at the present time.

The starting torque required to be developed by the section motors increased inversely as the gear ratio was decreased—also approximately 30 per cent. It was calculated that all the motors would develop sufficient starting torque with the possible exception of the drier section.

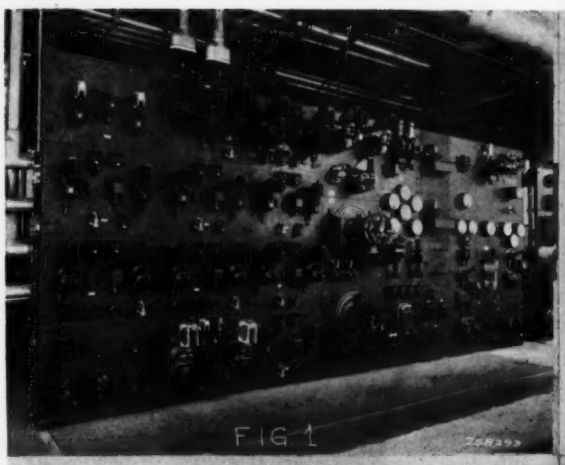
Some consideration was given to the use of a 75 horsepower a-c geared kicker motor with an overrunning clutch to provide additional starting torque. This arrangement was abandoned in view of the possible addition of future driers and it was decided to install a fourth d-c drier section motor rated 175 horsepower. This new 175 horsepower motor would provide the required starting torque as well as sufficient capacity for the future addition of more drier rolls and it could be installed in the present 70 horsepower motor position and the 70 horsepower motor moved towards the wet end where an intake shaft on the drier train was available. This rearrangement of the driers would also correct any tendency of the driers to "pile-up" at starting which had been encountered since the installation of the additional drier section in 1935.

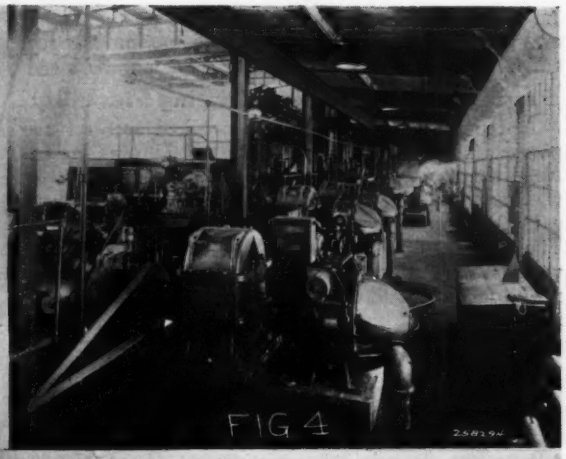
The gearing of the various sections was rearranged in conformance to the following tabulation:

Section	Gear Ratio Old	Gear Ratio New	Gearing Parts
Couch	13.6	11.2	From 1st Dryer Section
1st Press	17.3	13.7	New
2nd Press	17.3	13.7	New
3rd Press	15.4	11.7	New
1st Dryer	11.2	8.0	New
2nd Dryer	11.2	8.0	New
3rd Dryer	14.5	11.7	New
4th Dryer	...	8.0	New Section Complete
1st Calender	13.6	10.1	New
2nd Calender	13.6	10.1	New
Reel	22.3	17.3	From 1st Press Section

As indicated in the tabulation gear parts from the

[1] Sales Dept. Westinghouse Electric & Mfg. Co., Richmond, Va.





FIGS. 1, 2, 3, 4, 5 AND 6.

FIG. 1. View of the Control Board for the Sectional Drive, Modified to Make Use of the Motor-Generator Set, an Additional Dryer, and Other Modifications.

FIG. 2. The New Westinghouse 750-kw. Motor-Generator Set, Supplying Power to the Sectional Drive.

FIG. 3. The Old Motor-Generator Set with the 600-kw. Running Generator Which Was Redesigned into a Starting Generator by the Addition of Interpole Field Coils.

FIG. 4. Looking from the Wet End toward the Dry End along the Driving Side of the Paper Machine.

FIG. 5. View along the Driving Side of the Paper Machine, Showing Individual Drives on the Dryer Sections. The New Westinghouse 175-Horsepower d-c Motor and Its Associated Gear Unit on the Fourth Drier Section Are Shown in the Foreground.

FIG. 6. Looking from the Reel Section toward the Wet End along the Driving Side of the Paper Machine, Showing the Individual Driving Units.

1st drier section were suitable for use on the couch, and from the 1st press section for use on the reel and therefore new replace parts were not required.

Rearrangement Provides Operating Flexibility

A unique arrangement was worked out on the power units to handle the additional load plus the future drier load. As increased d-c generating capacity was required, a new 750-kw d-c generator driven by a a 1100-horsepower synchronous motor was installed. The original 500-kw "Running" generator was converted to a "starting" generator by the addition of new inter-pole field coils, to provide for 2300 amperes momentary starting current. The original starting generator was retained to be used as a running generator for the winder drive to provide additional capacity for this stepped up operation. The flexibility of this arrangement is apparent in that complete standby is now provided at decreased paper speeds by reverting to the original operating setup.

Equipment Modified for New Conditions

In the operation of the drier section the four drier motors would be required to operate in parallel when geared together and thus connected to a common load. This presented a problem of maintaining accurate speed regulation of these motors and at the same time maintaining proper load division. In order to secure accurate differential speed regulation as required on each section of the paper machine it is necessary to have a fairly flat inherent motor "speed-load" characteristic, on the other hand to secure a proper load division between the motors which are geared together they must be provided with sufficient compounding to prevent load shifting. Both of these desirable conditions were met by using a special combination of a cumulative and differential series field winding with an equalizer connection. The cumulative action is effective for each motor up to the equalizer connection. From this point on it is neutralized by the differential winding so that the over-all performance of the four motors is similar to a motor having a comparatively flat speed-load characteristic.

It was necessary to increase the capacity and range of the carbon pile section differential speed regulator on the drier section to permit it to handle the additional shunt fields of the 70-horsepower motor added in 1935 and the 175-horsepower motor to be added with the proposed change. To meet these requirements a small 15 ampere motor driven pilot exciter was installed. Instead of operating in the motor shunt fields direct the carbon pile regulator was arranged to control only the excitation of the pilot exciter. This arrangement materially increases the range and capacity of the drier section carbon pile differential speed regulator.

Minimum Shutdown Desirable

With the engineering details completed plans were carefully formulated for the revamping program to insure a minimum delay in production. Operation was on a continuous seven day week basis and each 24 hour interruption was evaluated at several thousand dollars. Delayed paper shipments also meant that a speedy return to production was of paramount importance. To eliminate any chance of unforeseen delays and to insure rapid and careful progress, the entire changeover program was placed in charge of the Westinghouse Service Department. In setting up a plan of action the following work to be done was scheduled under two classifications:

Work to be done prior to Shut-Down

1. Pour foundation and erect 750 kw. motor generator set.
2. Provide temporary 2300 volt service and test set without load.
3. Erect in place control panel for 750 kw. generator at right of present control board.
4. Erect starting panel for 1100 horsepower synchronous motor adjacent to 750 kw. generator panel.
5. Pour foundation for 70 horsepower dryer motor and speed reducer, between present 1st and 2nd dryer motor.
6. Install all possible conduit and cable.

Work to be done after Shut-Down

1. Move 70 horsepower 3rd dryer motor and speed reducer to new position.
2. Install new gear parts in 70 horsepower 3rd dryer motor.
3. Pour foundation with quick setting cement and erect new 175 horsepower 4th dryer motor and speed reducer in old position of 3rd dryer motor.
4. Install new gear parts in 1st and 2nd calender speed reducers.
5. Install new gear parts in 1st press, 2nd press, 3rd press, 1st dryer and 2nd dryer.
6. Install gear parts removed from 1st dryer in Couch speed reducer.
7. Install gear parts removed from 1st press in reel speed reducer.
8. Remove couplings from present low speed shafts and press on low speed shafts of new gear parts. (New shafts were furnished with new gear parts to speed up revamping program.)
9. Install new cumulative and differential fields on first, second, and third dryer motors.
10. Install new interpoles and field coils on present 500 kw. generator to increase momentary current rating for starting service.
11. Turn down commutator of 500 kw. generator.
12. Remove present 500 kw. rheostat panel from control board and substitute new combination 500 kw. and 750 kw. generator rheostat panel.
13. Install control for new 4th dryer motor to start in series with present 3rd dryer.
14. Install control for new 4th dryer to accelerate and run in parallel with 1st, 2nd, and 3rd dryer.
15. Install bus extension on control board to accommodate new 750 kw. generator.
16. Rewire control board to use 750 kw. generator as running generator, 500 kw. generator as new starting generator or running generator, present starting generator as running generator for winder drive or as starting generator for paper machine sections.
17. Make final electrical connections.
18. Check dryer motors for rotation.
19. Close various section couplings.
20. Adjust all carbon pile differential speed regulators for changed operating range.
21. Make final tests and adjust resistance on booster pilot exciter.

Jumping the Starting Gun

The work to be done prior to the shut-down was completed in a leisurely manner utilizing the mill's electrical force under the Westinghouse Service Department's supervision. On Saturday July 19, an order of light weight uncalendered paper was made. It was decided that the two 175 horsepower drier motors would handle the drier section on this load. When this change in paper weight was made, paper machine was shut down for 30 minutes and couplings opened on 3rd drier, 1st and 2nd calenders. This permitted the completion of items 1 to 4 inclusive as listed under "Work to be done after Shut-Down" with the paper machine in operation.

Shut-Down and Changeover

After a careful check had been made to insure that all required equipment was available, the mill was shut down at 7 A. M. on Monday, July 20. In line with the pre-arranged plan, a group of men was assigned to each specific job. Each group of men was supervised by a Westinghouse Service engineer, specially trained in that type of work under his responsibility.

Handling the speed reducers were three factory service engineers, each with a group of 4 mechanics. The speed reducers were dismantled, oil drained, new parts installed, lined up and reassembled. Previous experience had indicated the possibility of delays in removing the couplings from the present low speed gear shafts. Anticipating this possible delay a special 100-ton coupling remover was constructed for the purpose. With the aid of dry ice packed firmly around the shafts, and with the use of acetylene torches on the couplings, they were removed without difficulty. It was of interest to find that after nine years of service the gears and pinions were in as good con-

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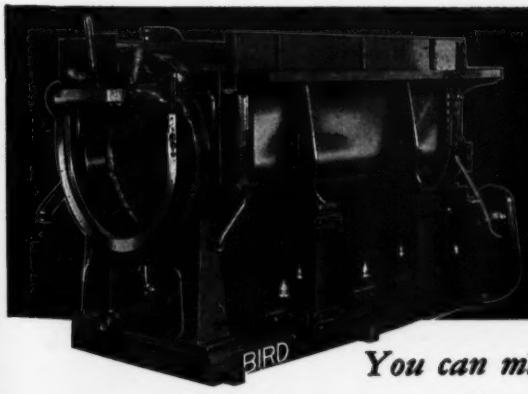

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dition as originally installed and the wear was not measurable.

Six separate groups quietly swung into the electrical work and followed through the prearranged schedule with clocklike precision. Supervisors, mechanics, electricians, riggers, helpers—sixty men—were working on the drive at the same time and still there was not the slightest delay or semblance of lost motion. The rapid progress made a very difficult job appear astonishingly easy.

Wednesday afternoon, July 23, the final electrical connection had been made. Wednesday night the 500 kw generator commutator was turned down, electrical work tested and the drier motors checked for rotation. The next morning resistance values were calculated and the differential speed regulators were adjusted from calculations for the new operating range. At 11:30 A. M. Thursday, the electrical program had been completed, and repairs to paper machine finished. Coupling connections were closed and the paper machine was ready to roll.

At 1 P. M. the various sections of the machine were turned over. When the drier section was started a broken gear and bearing cap in the drier train caused a five hour delay in making paper, while a new gear was installed.

Back in Production

At 6 P. M. the sections were again started and in 30 minutes a sheet of 20 point paper was across the machine at 600 fpm. Exactly 83½ hours after the mill was shut down it was again back in full production. Truly an accomplishment that reflected carefully engineered details and a sound plan of action that was efficiently executed with skillful and coordinated supervision. The fact that once the machine turned over it was not again shut down for any purpose was most pleasing. All calculated adjustments were entirely satisfactory and regulation was perfect on all sections. Four days later a continuous 30 hour run of nine point paper was made at 1060 fpm without a particle of difficulty and no further adjustments.

To Investigate Forestry in South

Announcement has been made that Henry S. Graves, Dean Emeritus of the Yale School of Forestry, has accepted an assignment from the General Education Board of New York, to make an extended investigation of the problems of education and research in forestry in the southern states. The purpose is to study present educational and research activities by different agencies, in order to determine possible measures for their further development and improvement. The project is based on the belief that education and research constitute one of the most effective means to advance forestry in the South and thereby to secure the benefits of well managed forests in improving and maintaining the economic and social conditions of rural communities. The study will by no means be confined to activities of colleges and universities but will include possible contributions by schools of all levels and extra-school agencies.

Mr. Graves will be assisted by Hillis L. Howie of Indianapolis, who is completing his work for the Ph.D. degree in the Yale School of Graduate Studies. Mr. Howie is specially well qualified to participate in the investigation through his knowledge of educational problems, background of science, and experience as a teacher.

SOUTHLAND PAPER MILLS START

(Continued from page 13)

conveyor system is nearly completed and will be stroking the grounders direct from the huge woodpile.

The present force in the paper mill is 135, which will be increased to between 175 and 200 as soon as the mill gets into capacity production of 150 tons of paper daily, or 50,000 tons annually.

Grinders Perform Satisfactorily

Dr. Charles H. Carpenter, chief chemist of the Lufkin paper mill, is satisfied with the performance of the grinders, the water from the deep wells, the general mixture of ground and chemical pulp and the character of the paper produced to date, although he sees various refinements ahead as a new paper technique is developed under entirely new conditions and meeting new requirements.

After two weeks of intensive technical research and checkup, the chemical laboratory early Friday gave the signal that a complete paper run could be ventured. In every way it was satisfactory. As evidence, it is only necessary to take a look at the great rolls of newsprint which have come from the papermaking machine. They are meeting every exacting test at the mill and are expected to meet the final test of taking printer's ink perhaps by the end of this week or some time next week.

Get Patent for Reclaiming Wax Paper

A United States patent for a new method of reclaiming waxed paper, formerly wasted because of manufacturing defects, has been issued to the National Oil Products Company of Harrison, N. J. The new emulsifier, trade named "EX-O-WAX," is claimed by the Technical Service Department of NOPCO to be "a solution to the problem of reclaiming waxed paper broke in the mill."

Of this new emulsifier, the National Oil Products Company technicians report: "All grades of waxed paper may be reclaimed. This makes available high grade low cost stock for improving the finished product. The treatment is satisfactory for reworking the waxed waste in mills where a waxed size is of advantage in the finished paper since both the fiber and the wax may be re-used by mixing with fresh stock. However, if fibers alone are wanted by the finished stock, the emulsified wax can be separated by washing it free from the fibers."

Folding Paper Boxes

Under the title, "Folding paper boxes an aid to profitable packaging," the United States Department of Commerce has issued its latest trade bulletin. The author is James D. Studley, chief of the pulp and paper section of the Forests Productions Division. This 60 page publication provides much useful information on the manufacture of paper board, the varied profitable uses of folding paper boxes, printing, special coatings, the economic status of the folding box industry, foreign trade and reading references. Copies of this bulletin may be obtained from the Superintendent of Documents, Washington, D. C., at 15 cents a copy.

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Program of Annual Canadian Convention

Twenty-sixth Annual Convention of Canadian Pulp and Paper Association To Be Held In Montreal — D. C. Everest Among Speakers—Many Important Technical Addresses To Be Presented—Forestry Training Plan.

[FROM OUR REGULAR CORRESPONDENT]

MONTREAL, Que., January 22, 1940—The annual meeting of the Canadian Pulp and Paper Association is being held here this week, marking the completion of the 26th year of an organization which from its inception has been a powerful influence in the growth of an industry that has developed in that time from a relatively minor position in the national life to the largest export industry in the Dominion. As is usual, practically all the leading men in the industry are gathering for the meeting, which, with the attendant conventions of the Technical and Woodlands Sections, extends over three days. Dr. F. Cyril James, recently appointed principal of McGill University, and D. C. Everest, President of the American Paper and Pulp Association, New York, will address joint meetings of the two sections during the convention, and R. A. McInnis, president of the association, will address another joint meeting at lunch on the closing day of the meetings.

In addition to business and committee meetings, a number of addresses on technical subjects will be given at the meetings of the sections. These addresses are as follows:

Technical Section

"Twenty-five Years of the Technical Section," by J. N. Stephenson, editor of the *Pulp and Paper Magazine;* "Some Recent Developments in the Field of Lignin Chemistry," Dr. H. Hibbert, McGill University; "Effect of Grinding Consistency and Temperature," H. Andrews, Powell River Company; "Groundwood for Sulphite Reduction in Newsprint," D. D. Carr-Harris, Anglo-Canadian Pulp and Paper Company; "Influence of White-Water in Pulp Testing," R. de Montigny, Pulp and Paper Research Institute; "Forced Digester Circulation and Chip Packing," L. C. Kelley, British Columbia Pulp and Paper Company; "Heat Recovery in Sulphite Mills," H. Mason, Anglo-Canadian Pulp and Paper Company; "Effect of Chipping on Suitability of Wood for Sulphite Pulping," H. Green and F. H. Yorston, Research Institute; "Dryer Waste Heat Recovery," R. J. Chambers, Anglo-Canadian Pulp and Paper Company; "Bark Burning," K. LeBaron, Canadian International Paper Company, Three Rivers; "Waste Into Production in Newsprint Operation," F. A. Soy, Price Brothers and Company; "Control of Slime at Ontario Paper Company," J. M. Forrester and E. G. Kirby, Ontario Paper Company; and "Tests for Printability of Paper," W. B. Beazley, Research Institute.

Woodlands Section

"The Effect of War Conditions on the Pulp and Paper Industry," Paul Kellogg, of Stevenson and Kellogg, Limited; "Further Considerations of Pulpwood Evaluation," J. V. Martin, Munising Paper Company; "Trends in Pulpwood Costs," R. S. Armitage, Price Brothers and Company; "Care and Stabling of Woods Horses," J. W. Sutherland, Canadian International Paper Company; "Sectional Steel Chutes for Pulpwood," J. L. Kelly, Price Brothers and Company; "Portable Pulpwood Slashers," E. E. Granger, Canadian Pulp and Paper Association; "Pulpwood Cutting, Technique and Equipment," A. Koroleff, Canadian Pulp and Paper Association; "Woods Labor," L. A. Nix, Bathurst Power and Paper Company; "The Trend of Forest Conservation in the Southern Pulpwood Industry," Frank Heywood Jr., Southern Pulpwood Conservation Association; "Operating Costs as Related to Depletion Charges," W. F. McColm, Price Brothers and Company; "Jobbers' Camps," J. N. Fitzgerald, The E. B. Eddy Company; "Skidding with Tractor and Sulky," C. C. Atkinson, J. A. McNally, W. J. Carson, D. J. McNeil, and others; "Mechanization of Logging Operations," A. Koroleff; "Reference to Pacific Coast Logging," E. B. McGraw, Ontario Paper Company; "A Report on the Forest Insect Survey," J. J. deGryse and A. W. A. Brown, Division of Entomology, Department of Agriculture; "A Review of the Spruce Sawfly Parasite Situation," A. B. Baird, Division of Entomology, Department of Agriculture; and "Balsam Fir Butt-Rot in Relation to Some Site Factors," C. Heimburger and A. W. McCallum, Dominion Forest Service.

National Forestry Training Plan

The Quebec Government has made an offer to match equally whatever contribution the Dominion Government may be disposed to advance for the development of a National Forestry Plan somewhat akin to that under which the Civilian Conservation Corps operates in the United States. Under this proposed plan national parks would be further developed and there would be an enlargement of the present arrangements whereby youths employed in government-maintained forestry camps are trained in all branches of forestry work with the idea of preparing them for employment in private enterprise.

Comeau Bay Reached by Automobile

For the first time in history overland contact between the "newsprint city," Comeau Bay, and the rest of Canada has been established by a party of five men who arrived at Comeau Bay from Murray Bay by automobile, the machine being equipped with caterpillar tractor treads. The party left Murray Bay at three o'clock in the afternoon and arrived at Comeau the next morning, the trip being made without mishap over the right of way of the new highway which is now under construction and which will establish a permanent contact with the rest of civilization when it is completed next summer.

Located a few miles below Rimouski on the opposite side of the Gulf of St. Lawrence, Baie Comeau is the site of the newsprint development of the Quebec North Shore Paper Company which manufactures newsprint for *The Daily News,* New York.

Pulping to Feature TAPPI Meeting

The steady record of progress in the chemical pulping industries will be reflected in the programs of the Technical Association of the Pulp and Paper Industry annual meeting to be held at the Roosevelt Hotel, New York, N. Y., on February 19 to 22, 1940. Among the papers to be presented are the following on sulphate and kraft pulp manufacture:

SULPHITE PULPING

1. A Time-Temperature Control for Sulphite Digesters by R. Inderdohnen.
2. The Coloring Matter of Sulphite Liquor, by L. E. Simerl.
3. The Wallin and Svennson Circulating System, by Sven Wahlgren.
4. Effect of Acid Concentration on the Temperature Schedule, by G. H. Chidester and J. N. McGovern.
5. The Economical Disposal of Waste Sulphite Liquor, by G. H. Tomlinson and L. S. Wilcoxson.
6. Recovery of Heat in Sulphite Mills, by W. H. Kraske.
7. Evaluation of Pulp Wood, by J. V. Martin.

ALKALINE PULPING AND BLEACHING

1. Sulphate Pulping of Douglas Fir, by M. W. Bray, S. L. Schwartz and J. S. Martin.
2. Circulation and Storage of Kraft Pulp, by G. A. Petroe.
3. The Theoretical Basis for the Action of Sulphide in the Kraft Pulping Process, by F. S. Hanson III.
4. The Application of Synthetic Salt Cake, by W. L. Savell.
5. Recovery Unit Performance in Burning Kraft Process Black Liquor, by L. S. Wilcoxson and F. G. Ely.
6. Bleached Sulphate Cylinder Papers, by A. B. Moore, Jr.
7. The Oxford and McGregor Deinking Processes, by F. B. Oldham.
8. Tall Oil, by H. L. Blengsli.
9. Kraft from Bagasse, by E. R. Whittemore.
10. Design of Gas Absorption Equipment, I. For the Production of Chlorine Water, by R. P. Whitney and J. E. Vivian.
11. Comparison of the Cooking Stain Method and Chemical Methods for Determining the Bleachability, of Pulp by J. Graff and J. F. Hechtman.
12. Review of Bleaching Literature by D. T. Jackson and J. L. Parsons.

Pacific Mills Make Improvements

[FROM OUR REGULAR CORRESPONDENT]

VANCOUVER, B. C., January 20, 1940—Pacific Mills Ltd. are spending approximately $20,000 in the extension of their plant for paper converting at Vancouver, B. C. This plant was erected about eight years ago to handle production of various paper products as a sideline of the big pulp and paper company's operations at its main plant at Ocean Falls, B. C.

Contract has now been awarded and calls for installation of a mezzanine floor with an area of about 10,000 square feet, and the raising of the roof of the plant. A new freight elevator will also be installed.

J. D. Stocker Goes With Curtis Mill

The Curtis Paper Company of Newark, Del., has recently announced the appointment of James D. Stocker as New York representative. Mr. Stocker, a graduate of Hotchkiss and Yale, has for the past five years been associated with the Allied Paper Mills. The New York office of the Curtis Paper Company will be located at 154 Nassau Street—telephone, Worth 21308.

The Curtis mill has been making fine papers at its present location at Newark since 1818 and it has been doing business under the Curtis name since 1848 and been known from that date as the "Nonantum Mills." Some of its lines carry this name. Although originally devoted exclusively to the manufacture of rag papers it now makes, in addition to rag content paper, high grade book and text papers for both letter press and offset; also cover, writing, envelope and specialty papers. The officers of the company are: Charles M. Levis, president; Irwin F. Megaree, vice president; Mrs. Herbert W. Mason, treasurer and secretary.

G. S. Borg Visits North American Mills

[FROM OUR REGULAR CORRESPONDENT]

VANCOUVER, B. C., January 20, 1940—While impressed with many aspects of the pulp and paper industry on the North American continent G. S. Borg, chemical engineer of Eskilstuna, Sweden still feels that Swedish methods are more economical, and are better designed to get the utmost out of the pine and spruce reserves of that country, which form the main backbone of the industry in Sweden.

Personally associated with construction of several plants in Germany and Poland, and acting as chemical research engineer for several Scandinavian plants, Mr. Borg is now on a tour of North America. He has visited every pulp and paper plant in the United States from Maine to Washington, and all major forest product laboratories. He was especially interested in plants in the southern states where research has developed an industry in making pulp from southern pine.

Mr. Borg plans to visit all plants on the B. C. coast, and will then visit plants in eastern Canada prior to returning to Europe.

Tax Assessments Set Aside

Tax assessments of $5,471.06 against the Minnesota Mining and Manufacturing Corporation, St. Paul, Minn., whose branch plant for manufacture of sandpaper and abrasives is located at Wausau, Wis., have been set aside by the Wisconsin Supreme Court in a decision rendered last week. The court declared invalid the state privilege dividend tax as applied to foreign corporations. The decision said in part: "The matter of financial exigencies of the state afford no justification for ignoring a law laid down by the United States Supreme Court. The state must find its revenues within the field in which its taxing power may be exercised as prescribed by the Constitution and the laws of the United States."

TAPPI Notes

H. J. Lips has joined the Dyestuffs Division of E. I. DuPont de Nemours, Wilmington, Del.

Robert E. Burkhardt, formerly night superintendent of Taggert Brothers, is now with the Central Hudson Paper Company, Cornwall-on-the-Hudson, N. Y.

G. A. Ritter, formerly of the Herty Foundation Laboratory, is now technical director of Kieckhefer Container Company, Delair, N. J.

The TAPPI Delaware Valley Section will meet at the Engineers Club, Philadelphia, on February 9. J. R. Atwater of Dill & Collins will talk on Costs and Cost Reductions.

The TAPPI Pacific Section will meet at Everett, Wash., on February 6.

Following are changes to be made in the TAPPI annual meeting program:

"Recovery of Heat in Sulphite Mills" by W. H. Kraske transferred from Acid Pulping Session to Heat and Power Session (2:00 p. m., Feb. 21, 1940).

To Coating Session (Feb. 20, 1940) add "An Evaluation of Calcium Carbonate Coating Colors Formulated With Various Adhesives" by H. F. Roderick and A. F. Hughes and remove "Pulp Colors and Their Use in the Art of Making Coated Paper" by J. R. Brierly and "Comparison of Casein, Soya Bean Alpha Protein and Various Starches as Adhesives in the Calcium Carbonate Coating Field," by A. J. Luth.

"Recovery Unit Performance in Burning Kraft Process Black Liquor", by L. S. Wilcoxson and F. G. Ely transferred from Alkaline Pulping Session to Heat and Power Session (Feb. 21, 1940).

Add "Sodium Chlorite Applications" by G. P. Vincent to Non-Fibrous Materials Preparation Session (2:00 P. M., Feb. 20, 1940).

Remove "Kraft from Bagasse," by E. R. Whittemore from Alkaline Pulping Session.

Add "Determination of Bleach Requirement of Wood Pulp" by C. M. Coon to Pulp Purification Session (2:00 P. M., Feb. 20, 1940).

Add to Microbiology Session (2:00 P. M., Feb. 20, 1940), "Spore Germination of Bacteria Commonly Found in Paper and Paper Products" by R. S. Breed (film).

Remove "Significance of Bacterial Counts," by R. S. Breed and J. R. Sanborn.

Add to Container Session (2:00 P. M., Feb. 21, 1940), "Prevention of Oxidation and Rancidity in Paper With Oat Flour", by Sidney Musher.

Add to Forming and Finishing Session, (9:30 A. M., Feb. 22, 1940). "The Decrease in Felt Life Due to Bacterial Action," by J. P. Weidner.

Insurance for Fitchburg Employees

FITCHBURG, Mass., January 15, 1940—The Fitchburg Paper Company has completed arrangements for a complete plan of group insurance for their employees which becomes effective immediately. The management of this firm believes that this plan offers to their workers and their families sound insurance protection at a low cost. The Fitchburg Paper Company is sharing the cost of this insurance equally with its employees.

The first benefit provided under the group plan is life insurance in amounts from $500 to $3000. This insurance covers all causes of death at any time or place and is payable in addition to any benefits obtained under workmen's compensation insurance.

The plan was underwritten by the Aetna Life Insurance Company through the office of George Butterfield.

The solicitation of the employees has been completed and a substantial majority has accepted the plan. Claims will be handled through the personnel department of the Fitchburg Paper Company and payments will be made weekly through this source by the claim department representative of the insurance company.

D. J. Murray Co. Takes Over Unit Heater

Effective in January, the entire Unit Heater and Cooler Company manufacturing and sales setup will be taken over by D. J. Murray Manufacturing Company, Wausau, Wis., the parent company. This move is being made so that manufacturing and sales of the "Grid" Unit Heater may be continued in a larger and more effective way.

The Unit Heater and Cooler Company was established in 1929 by D. J. Murray Manufacturing Company as the sales organization for the "Grid" Unit Heater and Cooler. During the past ten years, this unit has been so well established and so closely associated with the Murray name that the parent company has decided to simplify matters by dissolving the Unit Heater and Cooler Company and continuing the entire business under the Murray name, especially since the past year this company has been manufacturing and selling the "Murco" Unit Heater. The "Grid" Unit Heater is the all-cast aluminum radiation unit. The new arrangement the manufacturer states will result in more concentrated and extensive efforts on the behalf of their entire line of heating and cooling products, and will consolidate and improve engineering, manufacturing and sales staff more closely. The D. J. Murray Manufacturing Company management states that several new projects and items are now in the making which will be announced at a later date.

S. Douglas Fleet Goes To Richmond

The Albemarle Paper Manufacturing Company, Richmond, Va., announces that S. Douglas Fleet has been moved to the office at Richmond where he will have charge of plotting sales and sales promotion with J. P. Massie, vice-president. Mr. Fleet is a native of Virginia. He came with the company in 1925 and worked in the Richmond office until 1928 when he was placed in the sales department and stationed in the Chicago office. Since 1933 he has been selling in the Central and Southern States with headquarters in Cleveland.

To Make Paper Cans at Brockton

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., January 22, 1940—Machinery has been installed in Brockton, Mass., by the Norfolk Paper Company, Inc., Randolph, Mass., recently incorporated with a capital of $40,000 common stock. Among the products will be paper cans. The incorporators are C. Lloyd Claff, Chester E. Claff, and Leslie A. Claff, Randolph.

Paper and Twine Club to Dine

Stanley H. Andrews, chairman of the banquet committee of the Paper and Twine Club, announced this week that preliminary plans were well advanced for the annual dinner of the organization to be held during Paper Trade Convention Week. The affair will be staged in the Grand Ball Room of the Waldorf-Astoria on Wednesday evening, February 21, and the program calls for an evening exclusively devoted to entertainment.

Mr. Andrews emphasized that one does not have to belong to the Paper and Twine Club to make reservations and tables will be allotted as checks are received. Ten will be seated at a table.

He also says "Many of us recall with pleasure the old time convention social gatherings of American Paper and Pulp Association and the National Paper Trade Association, both of which over the years were held in the Grand Ball Room of the old Waldorf-Astoria. Inasmuch as these organizations do not plan any banquets this year, the Paper and Twine Club offers the only opportunity during Convention Week for all manufacturers, merchants and converters to get together and enjoy an evening of good fellowship."

The committee plans an elaborate stage review comparable to the best that is offered by the Great White Way. Although the first announcement of the banquet was only made on January 15, treasurer H. P. Price reports that checks have already been received from five concerns for 106 reservations. Last year the attendance was 515 and the committee believes that this total will be exceeded this year.

The dinner committee consists of chairman Stanley H. Andrews, H. P. Andrews Paper Company; vice-chairman E. F. "Bud" Miles, Crocker-McElwain Company; treasurer H. P. Price, A. Price & Son; Charles C. Walden, Jr., Walden, Sons & Mott, Inc.; Frank T. Roche, Lily-Tulip Cup Corporation; Donald Macaulay, S. D. Warren Company; E. R. Lyman, Missisquoi Corporation; Fred A. Mann, Dennison Manufacturing Company.

The reception committee consists of George S. Johnston, Champion Paper and Fibre Company; Lennox Ransom, Union Bag and Paper Corporation; D. K. Brown, Neenah Paper Company; C. J. Wittrock, Paragon Paper Company; Russell S. Madden, American Writing Paper Corporation; George Goodair, Mid-States Gummed Paper Company; Thomas Goulard, Walker-Goulard-Plehn Company; Fred Schlosser, Schlosser Paper Corporation; Edward J. Sickles, Bulkley, Dunton & Company; L. E. Sayer, Canfield Paper Company; John Johnston, Gaylord Container Corporation; George W. Sisson, 3d., Racquette River Paper Company; Phil A. Howard, Howard Publications; Frank W. Vaughan, Tested Papers, Inc.; Simon Walter, Philadelphia; Gordon D. Croskery, Parker-Young Company; Frank H. Purington, Eastern Corporation; D. J. Werner, Henry Lindenmeyr & Sons; J. E. Alcorn, the Alling & Cory Company, and E. J. Durkin, Hinde & Dauch Paper Company.

140 Tons Per Hour @ 4¢ PER TON MEANS TOWMOTOR Savings

This TOWMOTOR handles 16 bale skid loads (6850 lbs.) from warehouse to railroad car, up 15% grade, at a prominent Southern mill. TOWMOTOR speed and maneuverability enable this truck to handle to shipside as high as 140 tons per hour at costs reported to be within 4c per ton.

TOWMOTOR savings mean lower cost per year as well as lower cost per ton. Pioneers in straight gas power since 1919. Write for action picture bulletin and complete details today.

TOWMOTOR CO., 1220 E. 152nd St., Cleveland, Ohio
SALES OFFICES IN PRINCIPAL CITIES

CONSTRUCTION NEWS

Cohoes, N. Y.—The Mohawk Paper Mills, Inc., manufacturer of writing and other paper stocks, has completed plans for new addition to plant, consisting of a three-story and basement structure, 50 x 160 feet, reported to cost over $70,000, with equipment. Bids have been asked for general erection and work is scheduled to be placed under way at early date. C. F. Egan, Burdett Building, Troy, N. Y., is architect.

Wall Point, S. C.—The Southern Kraft Corporation, 220 East 42nd street, New York, N. Y., has made application to the United States War Department, Washington, D. C., for permission to construct a loading dock and drive mooring piles in the Kiawah River at Wall Point, to be used for pulpwood service. It is proposed to begin construction as soon as permission has been granted. As recently noted in these columns, company has work under way for expansion and improvements in mills at Georgetown, S. C., and Springhill, La., for increase of about 330 tons of kraft papers, container board, etc., at both mills, reported about $650,000, with equipment, and new loading dock is part of this general expansion.

Middletown, Ohio—The Crystal Tissue Company, manufacturer of tissue and other paper stocks, is said to be considering extensions and improvements in mill, to be carried out as a 1940 development program. Work will include a new addition and installation of equipment for increased capacity. Cost reported about $65,000, with equipment.

Ladysmith, Wis.—The Peavey Paper Products Company, manufacturer of tissue, crepe and kindred papers, has plans maturing for extensions and improvements in hydroelectric power plant, used for service at mill, operated under lease from Lake Superior District Power Company, Ashland, Wis. Work will include installation of new turbine and generating unit, with accessories, with switchboard and other equipment, and is estimated to cost about $150,000. Permission has been secured to proceed with project.

Chicago, Ill.—The Container Corporation of America, Inc., 111 West Washington street, manufacturer of corrugated boxes and containers, has approved plans for new one-story chemical house and water-softener building, 25 x 160 feet, and 35 feet high, at plant at 204 East North Water street, and will proceed with construction at early date. Bids have been asked on general contract. Company also has plans maturing for extensions and improvements in power plant at Ogden Division mill, Ogden and May streets, recently referred to in these columns, and will take bids for work at early date. A new boiler unit, with rated capacity of 75,000 pounds of steam per hour, will be installed, with complete auxiliary equipment. Robert E. Smith is company engineer in charge. This is part of a general expansion and improvement program of company, reported to cost close to $250,000, with equipment.

North Tonawanda, N. Y.—The American Box Board Company, 470 Market street, S. W., Grand Rapids, Mich., manufacturer of box board, test liners, etc., has plans under way for new addition to recently acquired industrial property on Shawnee road, North Tonawanda, including improvements in present buildings. New unit will be one-story, reported to cost close to $50,000, with equipment. Plant will be used for production of corrugated shipping boxes and containers, as well as for Eastern headquarters of company, and will be operated as the Buffalo Division. Work is scheduled to be placed under way at early date.

Menasha, Wis.—The Marathon Paper Mills Company, Menasha Products Division, has work nearing completion on new addition to mill on River street, consisting of a two-story and basement structure, 100 x 200 feet, to be used as a paper box and carton unit. It is proposed to have structure ready for service in February. Cost is estimated in excess of $60,000, with equipment. Erection is being carried out by the Permanent Construction Company, 2712 North Holton street, Milwaukee, Wis.

New York, N. Y.—The Seaboard Container Corporation, recently organized with capital of 100 shares of stock, no par value, plans operation of a local plant for the manufacture of paper boxes and containers. New company is represented by the Albany Service Company, 270 Broadway, New York.

Jeffersonville, Ind.—E. I. du Pont de Nemours & Co., Inc., Rayon Division, du Pont Building, Wilmington, Del., is reported securing options on tract of land in vicinity of Jeffersonville, to be used as site for new rayon mill for production of Nylon products, supplementing mill now being completed at Seaford, Del. Proposed plant, it is stated, will cost in excess of $4,000,000.

Toronto, Ont.—The Dominion Corrugated Paper Company, Ltd., 142 Weston road, manufacturer of corrugated boxes and containers, has plans for extensions and improvements in plant on Junction road, including new one-story addition, to be used for expansion in output. Cost is estimated close to $50,000, with equipment. Proposed to begin work at early date.

Corner Brook, N. F.—Bowater's Newfoundland Pulp and Paper Mills, Ltd., manufacturer of newsprint, has preliminary plans under way for expansion and improvements in mill, including several new one and multi-story units for pulp and finished paper-making divisions, to be equipped for an increase of about 30,000 tons per year over present output. Cost reported close to $2,000,000, with machinery. Work is scheduled to be carried out in 1940. Company is an interest of Bowaters Paper Mills, Ltd., 121 Queen Victoria street, London, England.

New Companies

New York, N. Y.—Ipco Paper Corporation has been organized with capital of 100 shares of stock, no par value, to deal in paper products of various kinds. New company is represented by Walter C. Redfield, 302 Broadway, New York, attorney.

Richmond, N. Y.—George W. Batz, Inc., Richmond, Staten Island, New York, has been incorporated with capital of $10,000, to deal in paper goods of various kinds. Ernest T. Lindemann, 26 Hyatt

street, St. George, S. I., attorney, is company representative.

Chicago, Ill.—The Fibers Separation Processes, Inc., 105 West Adams street, has been chartered with capital of 100 shares of stock, to manufacture fiber products. The incorporators include C. W. Sons, and L. R. Erein.

Boston, Mass.—Travers Envelope Company, 156 Pearl street, has filed notice of company organization, to manufacture commercial envelopes and other kindred paper goods. William J. Travers, 26 Arborough street, Roslindale, Boston, is head.

Ilion, N. Y.—The Corvan Seal Company, Inc., has been organized with capital of 100 shares of stock, no par value, to manufacture and deal in paper products. New company is represented by Fowler, Kowalczyk & Morris. Utica Gas & Electric Building, Utica, N. Y., attorneys.

Government Paper Bids

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., January 24, 1940—The Government Printing Office has received the following bids for 308,178 pounds (878,000 sheets) of 50 per cent rag, 38 x 48 white ledger paper; Aetna Paper Company, 10.23 cents; R. P. Andrews Paper Company, 9.37 cents; Barton, Duer & Koch Paper Company, 9.33 cents; Paper Corp. of the U. S., 10.49 cents; Stanford Paper Company, 10.64 cents; Mudge Paper Company, 8.71 cents; Whitaker Paper Company, 9.874 cents; Old Dominion Paper Company, 9.5779 cents; and Mathers-Lamm Paper Company, 12.59 cents.

For 6,500 pounds (200,000 sheets) of 21 x 32 blue sulphate manifold paper; Import Paper Company, 8.7 cents less 2 per cent; Old Dominion Paper Company, 9.59 cents; Whitaker Paper Company, 11.38 cents; Mudge Paper Company, 11.34 cents; Graham Paper Company, 9.25 cents; and Walker, Goulard Plehn Company, 11.5 cents.

For 5,000 pounds of 24 x 36 oiled manila tympan paper; Link Paper Company, 7.6 cents; Cromwell Paper Company, 8 cents; R. P. Andrews Paper Company, 7.45 cents; and Mathers-Lamm Paper Company, 7.6 cents.

For 19,000 pounds (100,000 sheets) of 27 x 38 chemical wood manila paper; Enterprise Paper Company, 6.51 cents; Barton, Duer & Koch Paper Company, 6.1 cents; R. P. Andrews Paper Company, 5.5 cents; Whitaker Paper Company, 5.87 cents; and Mudge Paper Company, 5.76 cents.

U. S. Sends More Paper Products to Cuba

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D .C., January 17, 1940—During recent years American participation in Cuban imports of paper products has increased, advancing from 75 per cent of the total in 1936 to 87 per cent in 1938, according to a report from the office of the American Commercial Attache, Habana. Thus foreign competition cannot be said to play a major role in this market, although until recently a large proportion of Cuban requirements in certain lines were secured from Europe. While it is yet too early to determine the extent to which the trade in these items will be affected, it already is apparent that new sources of supply are being sought by Cuban firms.

UNITED PIGMENTS

Pure Titanium Dioxide

UNITANE-O

A brilliantly WHITE, pure titanium dioxide possessing excellent . . .

• OPACITY

• BRIGHTNESS

• DISPERSION

Suitable for ALL types of paper ranging from thin printing papers and waxing tissues to coated book and magazine stocks.

UNITANE O—110 was especially developed for paper pigmentation. Its excellent dispersion in water promotes good retention and excellent sheet formation. As a component of the beater furnish, it produces *whiter* sheets of *great brilliance*, and superior printing qualities.

SAMPLES of UNITANE O-110 will be sent promptly upon request.

UNITED COLORS & PIGMENTS

UNITED COLOR AND PIGMENT CO.

DIVISION OF INTERCHEMICAL CORPORATION

NEWARK, NEW JERSEY

SALES OFFICES IN PRINCIPAL CITIES

FINANCIAL NEWS

New York Stock Exchange

High, Low and Last for the Week Ending January 24, 1940

	High	Low	Last
Armstrong Cork Co.	39⅛	38	39⅛
Celotex Corp.	10½	9⅞	10½
Celotex Corp., pf.	62	62	62
Certain-Teed Products Corp.	6½	6⅛	6⅜
Certain-Teed Products Corp., pf.	29½	28½	28½
Champion Paper & Fibre Co.	24⅛	23½	24⅛
Congoleum-Nairn Co.	23¾	22¾	23¾
Container Corp. of America	16⅜	15⅛	16⅜
Continental-Diamond Fibre Co.	6⅞	6⅝	6⅞
Crown-Zellerbach Co.	16	15¼	16
Crown-Zellerbach Co., pf.	90⅞	90¼	90¾
Flintkote Co.	19¼	18⅜	19¼
Robert Gair	3½	3⅛	3¼
Robert Gair, pf.	14⅞	14½	14⅞
International Paper & Power	13½	11¾	13½
International Paper & Power, pf.	55½	50¾	55⅜
Johns-Manville Corp.	74⅛	72	73½
Johns-Manville Corp., pf.	124¼	123⅛	124
Kimberly Clark Corp.	35½	35	35¼
MacAndrews & Forbes	35	34½	34½
MacAndrews & Forbes, pf.	133½	133½	133½
Masonite Corp.	38½	37⅛	38⅛
Mead Corp.	10½	10¼	10½
Paraffine Companies, Inc.	42	42	42
Paraffine Companies, Inc., pf.	101	100	101
Rayonier, Inc.	19½	16¾	19¼
Rayonier, Inc., pf.	28¾	27¼	28¾
Ruberoid Co.	19¼	18⅜	19¼
Scott Paper Co.	47	46¼	46¾
Scott Paper Co., pf.	114½	113	113
Sutherland Paper Co.	29	29	29
Union Bag & Paper Corp.	14¼	12⅜	14¼
United Paperboard Co.	5	4½	5
U. S. Gypsum Co.	87½	85	87
U. S. Gypsum Co., pf.	180	179½	180

New York Curb Exchange

High, Low and Last for the Week Ending January 24, 1940

	High	Low	Last
American Box Board Co.	6⅞	6⅛	6⅞
Brown Co., pf.	24	22	24
Great Northern Paper	43¾	43	43
National Container Corp.	10½	9¾	10½
St. Regis Paper Co.	3⅛	2¾	3⅛
St. Regis Paper Co., pf.	75½	63½	73½
Taggart Corp.	5⅛	5	5⅛

Moore Earns $2.70 Per Share

TORONTO, Ont., January 22, 1940—Earnings well above the $2.70 per share on the common stock reported for the year 1938, are indicated for the year 1939 for the Moore Corporation, Toronto. The past year is the first since the amalgamation of the F. N. Burt Company and the Moore Corporation. It is understood that the merger has worked out advantageously. The business of the company is divided into two major divisions—business forms of all kinds and small paper boxes, packages and display forms. The earnings may approximate 1937 results when $3.33 a share was shown. Profits indicated are in face of expenditures in rehabilitating the plants and equipment of the F. N. Burt Company. Efforts of the company have been to maintain prices to customers as low as possible consistent with increases that have taken place in materials.

Paraffine Nets $955,627

The Paraffine Companies, Inc., and subsidiaries for six months to December 31, reported a net profit of $955,627, equal after dividend requirements on 4 per cent cumulative convertible preferred stock, to $1.91 each on 476,062 no-par common shares, against $700,663 or $1.37 a common share for the final six months of 1938. December quarter: Net profit, $473,655, equal to 95 cents a common share, against $481,972 or 96 cents a share in the preceding quarter and $364,260 or 71 cents a share in the quarter ended December 31, 1938.

Celotex Profits Up 43 Per Cent

Net earnings of the Celotex Corporation for the fiscal year ended on October 31, 1939, were $741,756 after all charges and provision for Federal income taxes, compared with $518,358 in the preceding fiscal year, an increase of 43 per cent, according to the report issued last night by Bror Dahlberg, president.

After preferred dividend requirements the result for the last year was equal to 93 cents a share on 638,410 common shares. On the same basis earnings of the previous year equaled 58 cents a common share.

"Net sales were the largest in the history of the corporation, amounting to $12,317,936, an increase of $3,191,447, or 35 per cent over the previous year," Mr. Dahlberg said. The total included sales of gypsum products of the Port Clinton plant from the time of acquisition of that unit in April, 1939. The previous sales record was $10,600,000 in 1937.

The consolidated balance sheet for October 31, showed current assets of $4,363,535 and current liabilities of $2,056,504, compared with $3,970,842 and $1,666,561, respectively, on October 31, 1938.

The corporation increased its holdings in the common stock of the Certain-Teed Products Corporation to 147,260 shares, or 23.6 per cent.

A. P. W. Reports $42,638 Profit

A. P. W. Paper Company, Inc., on January 12 reported for the period from July 1 through November 18 net profit of $42,638 after expenses, etc., compared with a loss of $2159 in the corresponding 1938 period.

The company has accrued full interest on the 25-year 6 per cent convertible notes, but no provision has been made for additional contingent interest of 1 per cent on first mortgage bonds with warrants.

Under the plan of voluntary readjustment of funded debt the A. P. W. Paper Company, Inc., formerly Albany Perforated Wrapping Paper Company, holders of more than 96 per cent of outstanding 25-year 6 per cent convertible notes have assented to the plan and have agreed to accept interest payments on an income basis in lieu of fixed interest charge for the entire period to maturity in 1955.

That portion of the original plan relating to the reduction in interest on the first mortgage bonds due 1948 has been abandoned by directors and these bonds are now left undisturbed.

Johns-Manville Redeems Stock

The directors of the Johns-Manville Corporation have voted to call for redemption 10 per cent of the company's outstanding cumulative 7 per cent preferred stock.

The board's action will reduce the number of shares outstanding to 67,500 from 75,000. April 1 has been set as the date for the redemption of the 7,500 shares at the price of $120 per share, plus an amount equal to all dividends accumulated and unpaid at the redemption date. Selection of certificates will be by lot and will be made on March 4.

Indianapolis Slower

[FROM OUR REGULAR CORRESPONDENT]

INDIANAPOLIS, Ind., January 22, 1940—Weather conditions in this section during the past week didn't do the paper business any good. Sub-zero temperatures slowed all business down, but the trade hopes there will be a break of some sort over the week-end. In spite of conditions, there is considerable optimism in the trade and they view the past week as just one of those things that occur at times.

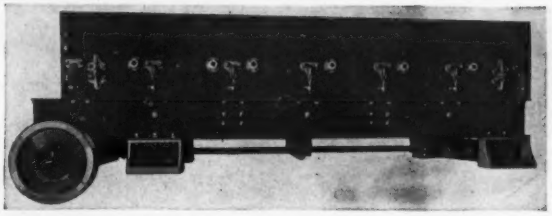
Lack of a good volume apparently did not deter the fine paper trade from doing some buying. Most of the buying was to balance and build up warehouse stocks that had been allowed to dwindle until after inventory. Fine paper prices remain firm and there have been no delivery difficulties. Quite a number of periodicals are published either here or in Central Indiana cities and lack of advertising has cut down the number of pages. This has hurt business to some extent. It is firmly believed that this situation will right itself during the next fortnight, when advertisers will begin to think of spring.

Some inquiries have been made regarding building paper and roofing, but orders are low. Some retailers have done some buying, but most of it is for delivery early in March when the building season is expected to get under way in case of an early spring. Retail stocks are very low and dealers do not want much on hand until after the assessment period on March 1. The outlook for a fine building year is good.

A slump in newsprint demand occurred last week with the closing of the post-holiday sales. Little improvement is expected during the remainder of the present month. Prices are firm. Tissue demand has been fair with no price changes.

The bag and wrapping paper market also has felt the weather situation and demand sank the last week. Container factories are in production, but most of their product is going into warehouses in preparation for spring.

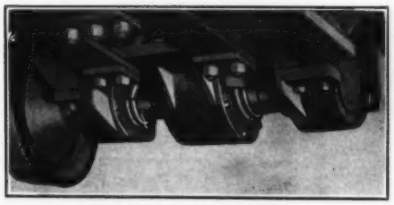
The rag and paper stock market showed little change, but was inclined to weakness in some lines.



2 FEATURES

that provide Finer Smoother Performance for the Appleton-Wagner Diaphragm Screen

A new method of flat screen operation, double rocker arms allow rapid vibration of the diaphragms without noise or pounding. Maximum capacity, positive action, lasting efficiency, no adjustments. This simple method provides the smoothest performance, easiest operation and greatest flexibility ever attained on any flat screen. Appleton-Wagner Diaphragm Screens fit easily into any mill arrangement. Wood, metal or special vats to fit any production requirement. Write for descriptive folder.



▲ ·1· ONLY 3 BEARINGS

This drive, 1 eccentric bearing and 2 roller bearings, will operate one to four screens in line with little power consumption. Appleton-Wagner Diaphragm Screens are so simple in design that most of the wearing and operating parts of former construction have been eliminated. No cams, no individual eccentrics, no roller shoes or toe blocks. Only the drive requires lubrication, takes little lubricant. For dependable, low cost screening of pulp, here is smoother performance and greater efficiency.

ROCKER ACTION ·2· ▼

THE APPLETON MACHINE COMPANY • APPLETON, WISCONSIN

Stevens Co. May Run Hampshire Mill

[FROM OUR REGULAR CORRESPONDENT]

HOLYOKE, Mass., January 22, 1940—Announcement was made this week that negotiations have progressed sufficiently to enable the closing of papers of agreement by which the Stevens Paper Company, may be enabled to re-open and operate the manufacturing property of the Hampshire Paper Company of South Hadley Falls. There are two paper machines in the factory and one of the older ones will be replaced by an 86-inch machine, thus bringing both to the same width. The Hampshire has continued its papeteries division, turning out Old Hampshire products by manufacture at the Carew Manufacturing Company plant, adjacent.

The Stevens Paper Company headquarters is in Windsor, Conn., where the company operates a board mill. C. N. Stevens is president and C. K. Kaiser is vice president and secretary. Both are residents of Windsor.

PAPER TRADE JOURNAL

Title Reg. U. S. Pat. Off.

Henry J. Berger
EDITOR

Vol. 110 January 25, 1940 No. 4

COMING EVENTS IN PAPER INDUSTRY

American Paper and Pulp Association, Sixty-third Annual Convention and meeting, Waldorf-Astoria Hotel, New York. February 19-22.

Technical Association of the Pulp and Paper Industry, Convention, Roosevelt Hotel, February 19-22.

Salesmen's Association of the Paper Industry, Annual Meeting and Luncheon, Waldorf-Astoria Hotel, New York, Tuesday, February 20.

National Paper Trade Association of the United States, Convention, Waldorf-Astoria Hotel. New York. February 19-22.

New York Association of Dealers in Paper Mills' Supplies. Annual Banquet, Hotel Commodore, New York, February 20.

New England Section. Technical Association of the Pulp and Paper Industry—Third Friday of each month at the Roger Smith Hotel, Holyoke, Mass.

Delaware Valley Section. Technical Association of the Pulp and Paper Industry—Second Friday of each month at the Engineers Club, Philadelphia, Pa.

Lake States Section. Technical Association of the Pulp and Paper Industry—Second Tuesday of each month at the Conway Hotel, Appleton, Wis.

Kalamazoo Valley Section. Technical Association of the Pulp and Paper Industry—First Thursday of each month at the Park, American Hotel, Kalamazoo, Mich.

SPENDING AND DEFICITS

While a rather large number of business men have expressed grave concern at the reckless spending policy of the New Deal which has piled up a huge public debt and indefinitely postponed balancing of the budget, the Administration is not worried about the size of the national debt. President Roosevelt views government deficits as an asset, providing the expenditures are made to provide "sound national assets". In expressing his views Mr. Roosevelt said, "That there is no subject on which there is more conscious or unconscious deception than the public debt."

"The debt accumulated since 1933 represents a far more prudent and productive use of our people's savings than much of the enormous private debts piled up in the twenties. The billions that were borrowed for speculation, for foreign loans, for second and third mortgages on over-produced commercial construction, hardly represented the most prudent use of our people's savings. Debt, whether individual, corporate or governmental, cannot be judged in a vacuum; it must be considered in light of earnings, assets and credit standing. When the increase in the national debt is viewed against the background of what was accomplished by the growth of useful physical assets, and of effective national earning power, and by the strengthening of the nation's credit and morale, there is no economic ground for anxiety, so far as the national debt is concerned, as to the nation's future."

In this conception of Federal economy it is seen that the size of the national debt is of little importance, providing the assets represented by the debt are "sound national assets." Although economists with divergent views on the subject have asserted that a rapidly rising national debt even of the present 42 billion debt, impairs confidence and thus retards the normal flow of invested capital into private enterprises, the Administration has an answer for that also. There is, in the opinion of the President's advisors, no justification to believe the Government can go bankrupt. One reason is that the national debt involves no problem of exchange, the debt is held entirely within the country, and the Federal Government has unlimited taxing power and can take away from holders of Government bonds enough to pay for the interest on those bonds. A third reason cited is that the Government possesses the power to permit it to control interest rates, which are now in many cases nominal. The answer to the fear of possible inflation is that there is no sign at present of inflation, as in 1937, and that inflation is a condition that results when consumers are able to buy more goods than industry can produce, thereby creating rising prices. This, states the President's advisors, would be met by a curtailment of debt creation. Thus, the only important requirement is that debt creation or government spending should be curbed when the labor and equipment of the country is fully occupied, and that a dollar's worth of sound assets are obtained for each dollar of debt created.

That this optimistic view of spending is not very convincing to many is indicated in the present activity in Congress to reduce the President's budget. The "sound national assets" apparently are not found returnable, dollar for dollar, in many of the full expenditures requested by the President. An attempt to reduce Government spending is being undertaken as preliminary steps essential to any serious attempt to balance the budget eventually. In advocating balancing of the Federal budget, Senator Burton K. Wheeler, progressive Democrat of Montana, said in his address at the dinner of the Congress of American Industry held in New York last month that, "It should never be forgotten that financial bankruptcy is the first and most direct step to political bankruptcy, to dictatorship. A dictator is but the receiver of a bankrupt nation. Let us, of course, realize that periods of national emergency, such as we have been experiencing, put the possibility of a balanced budget beyond the power of either a liberal or a conservative administration. Every thinking person realizes that every effort should be made to balance our national budget. The present Congress of the United States is aiming in that direction."

In a clear analysis of President Roosevelt's estimates of expenditures and income, Godfrey N. Nelson, lawyer, tax expert and secretary of The New

York Times Company said in part: "No planned method of creating business activity has as yet succeeded. Business has failed to respond to government spending in any sustained way and it has been demonstrated that capital cannot be maneuvered into productive channels so long as a more attractive form of investment is available. That which makes tax-free securities more attractive to persons of wealth is the high surtax rates. But high yields from investments in industry alone will not entice capital back into industry. The element of safety of principal and income enjoyed by tax-exempts must be overcome as well, and this and other factors can only be counter-balanced by prospects of returns from business commensurate with the degree of risk assumed by capital.

"Endeavors to balance the present budget would only act as a deterrent to the business expansion now in process. By encouraging business by reducing the surtax to a maximum rate of 50 per cent, or even 40 per cent, and by removing taxation obstacles which now deter business progress, it should be possible to relieve the government of such an amount of recovery and relief expenditures as to permit tax revenues to meet a reasonably normal budget."

I. P. Restores Wages

FORT EDWARD, N. Y., January 22—At a conference this week between officials of the International Paper Company and representatives of the International Brotherhood of Papermakers it was decided to restore the wage reduction voluntarily taken by employees in 1938. The increase represents a fraction above six per cent and becomes effective immediately. The conference dwelt on the wage question only, the general agreement between the company and the organization continuing until June 1. Delegates from the local unions of the International Brotherhood of Pulp, Sulphite and Paper Mill Workers were present from Fort Edward, Niagara Falls, Palmer, North Tonawanda, Livermore Falls and Orono, Maine. Managers of the company's mills in these places also attended while the International Brotherhood of Papermakers was represented by delegates from various locals. C. E. Youngchild, of Glens Falls, general manager of the book and bond division of the International Paper Company, was spokesman for the company. John P. Burke, of this place, president and secretary of the International Brotherhood of Pulp, Sulphite and Paper Mill Workers; S. A. Stephens, of Thorold, Ont., Canada, third vice president of that group; Arthur Huggins, of Albany, president, and Ernest Lampton, vice president of the International Brotherhood of Papermakers, also attended.

To Be Treasurer of U. S. Envelope Co.

SPRINGFIELD, Mass., January 22, 1940—Magnus F. Peterson of Longmeadow was last week elected treasurer of the United States Envelope Company to succeed the late William O. Day. Mr. Peterson has been secretary. At the same meeting, James Weir of Longmeadow was elected secretary. He had been an assistant treasurer.

Production Ratio Report

Based upon paper production reports to the American Paper and Pulp Association.

COMPARATIVE MONTHLY SUMMARIES[1]

Months	1939	1938	1937	1936	1935	1934
January	77.5%	63.9%	90.3%	76.1%	65.8%	—.
February	81.7%	68.7%	90.1%	77.9%	70.0%	.....
March	84.0%	69.6%	90.3%	76.0%	70.5%	.....
April	82.9%	68.3%	92.1%	82.3%	70.0%	.....
May	80.2%	69.0%	90.6%	81.6%	69.4%	.....
June	79.7%	66.0%	87.3%	80.7%	72.3%	.....
July	75.2%	72.0%	81.8%	77.3%	64.9%	.....
August	82.9%	77.2%	82.9%	81.5%	70.9%	.....
September	88.7%	76.3%	78.6%	80.5%	71.9%	58.2%
October	96.6%	82.5%	73.5%	87.6%	75.6%	64.7%
November	97.2%	79.6%	61.9%	88.0%	75.3%	61.7%
December	91.2%	74.4%	54.5%	85.9%	71.2%	59.6%
Year Average	84.9%	72.3%	80.6%	81.3%	70.5%	.....

COMPARATIVE WEEKLY SUMMARIES[1]

CURRENT WEEKS, 1939		CORRESPONDING WEEKS, 1938	
December 9	96.6%	December 10	77.6%
December 16	97.7%	December 17	81.3%
December 23	94.2%	December 24	75.9%
December 30	76.0%	December 31	62.8%
January 6, 1940	90.1%	January 7, 1939	70.0%
January 13, 1940	87.8%	January 14, 1939	80.4%

The following statistics show the number of mills reporting by ratio groups:

	Number of Mills Reporting—Current Weeks					
Ratio Limits	Dec. 9, 1939	Dec. '6, 1939	Dec. 23, 1939	Dec. 30, 1939	Jan. 6, 1940	Jan. 13, 1940
0% to 50%	35	37	30	60	48	36
51% to 100%	271	265	272	241	224	146
Total Mills Reporting	306	302	302	301	272	182

PAPERBOARD OPERATING RATIOS

Per cents of operation based on "Inch-Hours" reported to the National Paperboard Association.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July
1935	62%	68%	68%	63%	61%	66%	62%
1936	62%	67%	67%	70%	69%	70%	69%
1937	80%	86%	86%	88%	85%	77%	66%
1938	54%	60%	61%	57%	58%	56%	57%
1939	60%	67%	71%	69%	64%	67%	63%

Year	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1935	67%	71%	77%	71%	61%	66%
1936	75%	78%	82%	80%	74%	72%
1937	74%	69%	65%	55%	45%	73%
1938	66%	66%	70%	65%	59%	61%
1939	72%	74%	84%	81%	....	....

Week end. Dec. 9, 1939—79%
Week end. Dec. 16, 1939—79%
Week end. Dec. 23, 1939—81%
Week end. Dec. 30, 1939—46%
Week end. Jan. 6, 1940—65%
Week end. Jan. 13, 1940—74%

[1] Production-capacity ratios are based upon six-day capacity ratings which are adjusted periodically to correspond with the ratings reported by individual companies. Ratios are subject to revision until all reports are received.

Brown Co. Announces New Price Policy

The Brown Company, manufacturer of Nibroc Aqualized Towels, has announced a new policy in regard to mill prices that will give its distributors a sound basis for accepting orders for future delivery in spite of the present abnormal times. Effective January 1, 1940, wholesale prices of the Company's complete line of Nibroc Aqualized Towels was put on a three months, or quarterly, basis. The only departure from this policy will be when, and if, changed conditions warrant price reductions.

Firm prices to distributors have been established for all shipments from the mill during January, February and March. Prices for the second quarter will be announced on or about March 15.

The Brown Company is in a unique position to inaugurate such a policy. The Company not only produces its own exclusive pulps for making Nibroc Aqualized Towels, but also owns hundreds of thousands of acres of the finest Northern spruce and Northern birch trees.

5 "Controlling" Reasons FOR PAPER MILL PROFITS

1 FOXBORO VERIGRAPH MOISTURE CONTROL holds paper to any desired moisture balance while it is being dried. The result is product uniformity . . . pleased customers.

2 FOXBORO PULP COOKING CONTROL systems meet the needs of each type of process. The world's largest bleached sulphite pulp mill is Foxboro equipped. So are new Southern Kraft mills using alkaline pulp cooking.

3 FOXBORO PULP GRINDER CONTROL holds the stone temperature at a uniform level. This permits a better regulation of stock consistency and freeness, increased production, pulp at lower cost.

4 FOXBORO PNEUMATIC LOADING is the one modern automatic way to hold just the pressure you want on press roll, calenders, etc., with a record for future reference. It yields finer finishes, speeds operations.

5 FOXBORO FIELD EXPERIENCE . . . an intimate knowledge of paper-mill instrumentation problems and how to solve them on a practical basis . . . stands behind every installation. Foxboro's application specialists are out to put instruments to work where they can show profits for you in everyday plant operation.

Why not check up on the money-saving possibilities of modern Foxboro control methods in your plant? The Foxboro Field Man will give you a frank analysis of the opportunities for applying instruments to meet your own plant conditions as a means of improving product quality, cutting operating costs, assuring uninterrupted production. Or, write for one or more of the bulletins shown above for specific engineering information on how these instruments operate and why they give such trouble-free performance. **The Foxboro Company, 114 Neponset Avenue, Foxboro, Massachusetts, U. S. A.** Branch offices in 25 Principal Cities.

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PAPER MILL CONTROL

Section of the
Technical Association of the Pulp and Paper Industry

Edited by Ronald G. Macdonald, Secretary

Annual Report of TAPPI Delegates to Inter-Society Color Council

The following report has been prepared by John L. Parsons, of the Hammermill Paper Company, Chairman of the TAPPI Delegates to the ISCC.

The aims and purposes of the Inter-Society Color Council, of which TAPPI is a member body, are to stimulate and coordinate the work being done by various societies and associations leading to the standardization, descriptions and specification of color, and to promote the practical application of these results to the color problems arising in science, art and industry. The present membership of the Council comprises nearly a dozen member bodies and over fifty individual members. Each member body may elect up to ten delegates for representation on the Council, three of which are designated as voting delegates. The present TAPPI delegates to the Council are Messrs. J. d'A. Clark, M. C. Davis, H. W. Morgan, G. C. Munro, B. W. Scribner, Miss H. U. Kiely, E. Sutermeister, L. C. Lewis, J. L. Parsons, and the Secretary of the Association, of whom the last three are the voting delegates.

The work of the Council comprises a wide variety of activities. There is the Color Problems Committee which aims to gather information on and to assist in the solving of color problems suggested by the membership. Many of the various committee reports have become symposia on the topics concerned. During the past few annual meetings of the Council a technical program and also a popular evening program relating to some phase of color have been offered.

At the February 1938 annual meeting of the Council four papers were presented on the G. E. Recording Spectrophotometer and one paper on filters for theatrical lighting. These were subsequently published in the October 1938 issue of the "Journal of the Optical Society of America." At the February 1939 meeting six papers were presented at a symposium on color tolerance. These were published in the July 1939 issue of the "American Journal of Psychology." The "Parade of Color" was featured at the popular evening session, at which seven member bodies of the Council contributed to the program. Dr. J. A. Van den Akker, physicist at the Institute of Paper Chemistry, spoke on "Color in Paper" as the Association's representative. His talk was published in the TAPPI Section of the March 18, 1939 issue of the "PAPER TRADE JOURNAL.

Since the annual meeting in 1939 three News Letters, totalling 29 pages, have been issued by the Council and sent to all the delegates. The Council has also published, in mimeograph form, a comparative list of color terms which was compiled from reports submitted by delegates of member bodies. The color names report of the Problems Committee was officially adopted in June 1939 and published under the title of a "Method of Designating Colors," by D. B. Judd and K. L. Kelly, in the September 1939 issue of the Journal of Research of the National Bureau of Standards. Additional copies of the report may be obtained by ordering Research Paper RP 1239 from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents each. Although this method was designed specifically for drugs and chemicals, it is tentatively suggested by the Council for general use.

The Editor of the ISCC News Letter, Dr. I. H. Godlove, has compiled a bibliography on color covering 1922 to 1934 and announcement has been made that this bibliography is now available in bibliofilm form. It is known as Document #1162 and can be obtained for $1.39 from the American Documentation Institute, 2101 Constitution Avenue, Washington, D. C. The references number nearly 2500.

The technical session planned for the 1940 annual meeting comprises a symposium on spectrophotometry in the pulp and paper industry, jointly sponsored by TAPPI and the Color Council. This symposium will be held during the annual meeting of the Association at 2:00 P. M., February 21, 1940 in the Hendrick Hudson room of the Roosevelt hotel, New York City. The program, which it is believed will be of considerable interest to TAPPI members, is as folows:

Technical Session

Chairman: John L. Parsons.

Introduction: Dialogue between Mr. Papermaker and Mr. Meter (written by Drs. Judd and Lewis).

SURVEY OF INSTRUMENTS:

1. Survey of Spectrophotometers, K. S. Gibson, National Bureau of Standards.
2. Survey of Abridged Spectrophotometers, J. A. Van den Akker, Institute of Paper Chemistry.
3. Survey of Instruments in Use in the Pulp and Paper Industry (by title).

USE OF INSTRUMENTS:

1. In Pulp, R. S. Hatch, Weyerhaeuser Timber Co.
2. In Beater Furnish, R. N. Griesheimer, Mead Corporation.

3. In Uncoated Paper, Myrl N. Davis, Kimberly-Clark Corporation.

4. In Coated Paper, William J. Foote, Consolidated Water Power and Paper Co.

(The dialogue will follow through the program, serving to introduce each speaker).

Popular Session

Parade of Color, Chairman: Carl E. Foss.

1. Highlights of Color Reproduction History.

2. Color Reproduction Fundamentals, F. L. Wurzburg, Jr., Interchemical Corporation Research Laboratories.

3. Science Visits the Artist, William L. Longyear, Pratt Institute.

The annual meeting program will be concluded with a discussion session under the chairmanship of Deane B. Judd and a business meeting. It is planned to publish the entire group of symposium papers in the "PAPER TRADE JOURNAL."

During 1939 L. C. Lewis, R. G. Macdonald and J. L. Parsons contributed in various capacities to the work and program of the Council. The officers of the Council during the past year were Forrest L. Dimmick, chairman; M. Rea Paul, vice-chairman; Margaret Hayden Rorke, treasurer; and Dorothy Nickerson, secretary. The counsellors were Richard G. Slauer, I. H. Godlove, and John L. Parsons. The Council's officers recently elected for the period 1940-41 are Deane B. Judd, chairman: Carl E. Foss, vice-chairman; Norman Macbeth, treasurer; and Dorothy Nickerson, secretary. The counsellors are Henry P. Gage, LeGrand H. Hardy, and Sidney M. Newhall.

Two projects of the Optical Properties Committee, which have been held in abeyance during the past year owing to the work necessarily involved in preparation for the TAPPI-ISCC symposium on spectrophotometry, will be brought to the attention of the Council when advice is needed in connection with their solution. These projects are (1) a method for the preparation of a TAPPI magnesium oxide reflectance standard, and (2) a method for the testing of fading quality of colored and white papers.

At the suggestion of the Optical Properties Committee of the Association Deane B. Judd, chairman of the Inter-Society Color Council, has been invited to discuss the new color names method as applied to colored papers at the 1940 TAPPI Annual Meeting. Dr. Judd will discuss this subject under the title of "Systematic Color Designations for Paper."

Review Of Paper Industry Literature

Copies of United States Patents can be obtained from the United States Patent Office, Washington, D. C. for 10 cents each. Send currency, not stamps.

Combined Barking and Washing Drum. Herbert W. Guettler. U. S. pat. 2,140,287 (Dec. 13, 1938). —A rotatably mounted barking drum structure comprises a dry barking portion and a washing portion. A shallow water pan extends beneath the washing portion and about the latter substantially concentric therewith and close to it. A central discharge spout is provided, depressed below the bottom of the structure. Vanes are disposed on the outside of the washing portion to move the bark in the pan from the ends towards the discharge spout.—A.P.-C.

Method and Apparatus for Cleaning Wood Chips. Sven Rahmberg. U. S. pat. 2,143,497 (Jan. 10, 1939).—The chips are tumbled in a rotating screen drum having openings about ⅛ in. in diameter. A number of fine blast jets of fluid, such as air or steam, are projected from near the axis of the screen towards the inner surface thereof. These jets, which are preferably of high velocity, impinge on the tumbling chips and dislodge therefrom all impurities, including dirt, sawdust, bits of bark, etc. Suitable means are employed to promote and accelerate the flow of cleaning fluid through the holes of the screen so that all loose particles of sawdust or foreign matter are at once expelled from the interior of the screen drum.—A.P.-C.

Cylinder Paper Machine. William M. Leeson, assignor to The Sandy Hill Iron and Brass Works. U. S. pat. 2,148,376 (Feb. 21, 1939).—The cylinder mold is mounted so that it can be adjusted up or down, or towards or away from the wall of the vat. —A.P.-C.

High Speed Beater. Newenham A. Gray. U. S. pat. 2,138,632 (Nov. 29, 1938).—The beater tackle is so designed as to be a completely self-contained unitary assembly, entirely disassociated from the tub. The beater is provided with a shaft that is rotatable but otherwise stationary, so that stationary antifriction bearings can be provided in a frame or other mounting for the beater roll shaft, and a direct driven connection from a variable speed motor can be made with the shaft, thus enabling the circumferential speed to be changed while the beater is in operation. The tackle is designed so that stresses and strains are self-balancing, compensated and not transmitted to the tub or the mill floor. The beater plate is so mounted that rebound incidental to the passage of coarse pulp or obstructions between the roll and bedplate is absorbed in buffer springs; also, the pressure between the roll and bedplate can be varied from zero to maximum while the beater is in operation. The bedplate is movable on a radial line only, so that as wear takes place and the plate is adjusted closer to the roll, the concave face of the bedplate is not decentered.—A.P.-C.

Paper Making Machines. Oscar Rolls. Brit. pat. 488,999 (July 15, 1938).—The formation of air bubbles in pulp above the breast roll of highspeed paper machine is reduced or prevented by an enclosure adjacent the wire on the breast roll and extending to the pulp outlet. The enclosure may have a suction pipe and a drain pipe which may be exhausted with those for the main suction boxes or the suction may be produced by a waste-water "injector".—A.P.-C.

Cooking Cellulose. Otto Brune, assignor to Zellstofffabrik Waldhof. U. S. pat. 2,140,218 (Dec. 13, 1938).—Cooking liquor is withdrawn from the bottom of the digester by means of a pump and is passed through a jet apparatus arranged adjacent to the outlet of the pump. Steam is supplied to the suction side of the jet apparatus at a pressure lower than that prevailing in the digester, for heating the liquor. The heated liquor is delivered into the upper part of the digester.—A.P.-C.

Sectional Paper Machine Drive. Walter Ferris.

U. S. pat. 2,143,147 (Jan. 10, 1939).—The several sections are driven by a series of primary prime movers which are not necessarily synchronized. Each section is connected to its primary prime mover through a generator driven by the primary prime mover and a secondary prime mover connected to the paper machine section and operated by energy supplied from the generator. A regulator is provided for adjusting the transmission to vary the speed of the secondary prime mover relative to the speed of the primary prime mover. Means are provided for adjusting one of the regulators to enable the transmission controlled by it to function as a master, and means are also provided for adjusting at least one other regulator to cause the transmission controlled by it to follow the master transmission in respect to all changes in the output speed thereof. The last-mentioned means includes a differential gear having one leg driven at a speed proportional to the output speed of the master transmission and a second leg driven at a speed proportional to the output speed of the follower transmission, whereby the third leg of the differential reflects any variation in the output speed of the follower relative to that of the master transmission. Motion from the third leg of the regulator is transmitted to the regulator of the follower transmission to cause it to correct any variation in the output speed of the follower transmission relative to that of the master transmission.—A.P.-C.

Means for Circulating Liquor in Pulp Digesters. Otto Kreissler, assignor to American Lurgi Corporation. U. S. pat. 2,138,455 (Nov. 29, 1938).—Deposition of gypsum on the tubes of the heater of an externally heated digester is prevented by supplying the circulating liquor, prior to its entry into the heater, with sulphur dioxide or other suitable gases. To this end, there is interposed in front of the heater an injector, actuated by the circulating liquor, in such a manner that the liquor is pumped out of the digester at the point of lowest pressure and is brought into association only in the delivery tube of the pump (i.e., at a pressure higher than that existing in the digester) with the gases that prevent deposition of gypsum. —A.P.-C.

Felt Guiding Mechanism. Wm. C. Nash, assignor of one fifth each to Mary Jones, Marie Duval Nash, Wm. M. Nash and Roy A. Nash. U. S. pat. 2,136,705 (Nov. 15, 1938).—The mechanism is mounted so as to act upon the felt at a point where it is travelling substantially vertically. A feeler or palm is maintained in contact with the edge of the felt by means of a spring. Displacement of the feeler in either direction is used to operate mechanism which either raises of lowers one bearing of the guide roll, thereby displacing the felt to restore it to its original position.—A.P.-C.

Apparatus for Drying Felts of Paper Making Machines. The Watford Engineering Works, Ltd., John Paramor, Cecil P. Pluthero and John Brown. Brit. pat. 490,560 (Aug. 17, 1938).—Felts, bands, etc., of paper machines, etc., are dried by forcing hot air, etc., through them while they pass about a perforated or wire-wound roll, the air, etc., being forced or sucked through the felt, etc., through a conduit in the middle or at one side of the machine, and a funnel, the upper edges of which may be thickened to face against the roll.—A.P.-C.

Device for the Continuous Cleaning of Paper Pulp. A. Bergès. Belg. pat. 429,075 (Aug. 31, 1938). —The pulp inlet is in the form of a volute having a rectangular transverse cross-section, the base of which is parallel to the axis of the machine. The lower portion of the latter is conical, increasing diameter from the stock inlet to the bottom, while the upper portion also is in the form of a truncated cone with the large diameter at the top.—A.P.-C.

Cross-Current Flow Fourdrinier Paper Machine. Earl E. Berry, assignor to Beloit Iron Works. U. S. pat. 2,139,874 (Dec. 13, 1938).—The stock is coated on to the wire at an angle to the direction of travel of the latter so that the fibers will not largely be in a direction parallel to the travel of the wire. The invention provides for the maintenance of flowing ponds of stock above the fourdrinier wire and the deposition of the stock directly from the ponds on to the wire.—A.P.-C.

Head Box for Fourdrinier Machines. Orcutt W. Frost, assignor to Wood Conversion Co. U. S. pat. 2,148,613 (Feb. 28, 1939).—Stock from a constant-level supply is discharged over a spillway in the same direction as the travel of the wire. At the bottom of the spillway there are a stop and a flow sheet leading under the spillway to reverse the flow of the stock. From the rear end of the shelf the stock drops down on to the wire. A dam is provided in advance of the shelf to form a pool of stock on the wire.—A.P.-C.

Paper Machine Press. William H. Millspaugh, assignor to Sandusky Foundry and Machine Co. U. S. pat. 2,144,770 (Jan. 24, 1939).—In a paper machine embodying a suction press or presses and felt or felts, the stationary suction box within the suction roll is so arranged that the fluid-tight packing between one side of the suction box and the inner surface of the suction roll is arranged at the inlet side of the bite between the two coating rolls of the press, and at such a distance from the bite that perforations in a circular portion or segment of the suction roll at the inlet side of the bite, will be in communication with the interior of the suction box, and the felt (or felts) carrying the paper is arranged to enter or pass through the bite in such a direction that the felt will not close the whole of the perforations in the circular portion of the suction roll at the inlet side of the bite communicating with the suction box. The packing between the opposite side of the suction box and the inner surface of the suction rolls may be arranged opposite the bite, or in some cases, it may extend beyond the bite.—A.P.-C.

Supplying Pulp to Paper Machines. Ernest Poirier, Brit. pat. 492,778 (Sept. 27, 1938).—Variations in the consistency of a stream of pulp are rectified by causing the stream to flow under constant head through a container the inlet of which is of such shape and resistance that the level in the container drops or rises as the consistency increases or decreases and adding water or white water to the pulp immediately preceding the inlet in accordance with the variations in level in the container.—A.P.-C.

Paper Making Machines. James Smethurst. Brit. pat. 492,574 (Sept. 22, 1938).—The bearings at each end of a guide roll are pivoted, and carried on a slide moved by a pinion on an arm pivoted to a rod carrying adjustable feelers contacting the edge of the wire or felt.—A.P.-C.

Apparatus for Controlling and Regulating the Operation of Paper Making Machinery. Hermann Palm. Brit. pat. 492,926 (Sept. 29, 1938).—In apparatus wherein a stream of pulp flowing over an overflow into a channel is divided by a movable slide into

two parts, one of which flows on to the paper machine while the other returns to the mixing vat, the slide is operated by a motor and a remotely situated indicating device is operatively connected with the motor so as to be displaceable simultaneously and proportionately to the displacement of the slide.—A.P.-C.

Process and Device for Increasing the Action of the Last Wet Press of Paper Machines and Similar Machines. A. Danninger, Steyrermuhl & H. Schmolka, Vienna. Aust. pat. 151,186 (June 15, 1937).—Radiating heat bodies are arranged before the last wet press in such a manner that both the felt and web are heated.—J.F.O.

Improvement to Methods and Apparatus for Purifying Pulp Suspensions. Erkensator G.m.b.H. Belg. pat. 426,879 (April 30, 1938).—The discharge conduit is shaped so as to suppress eddies in the stream of impurities being discharged.—A.P.-C.

Jordan Roll. Adam E. Bridge, assignor to The Black-Clawson Company. U. S. pat. 2,146,791 (Feb. 14, 1939).—Provision is made for very securely anchoring inwardly tapering portions of the knives in longitudinally extending slots provided in the frustoconical plug body, the latter being provided with a series of annularly extending knife-retaining bands which are adapted for cooperation with suitable tongues and recesses on the inner portions of the knives. The latter are secured in position by a movement toward the plug axis and then by a longitudinal or endwise movement along the slots, to a limited extent.—A.P.-C.

Method and Apparatus for Refining Pulp. Miles L. Edwards. U. S. pat. 2,148,448 (Feb. 28, 1939).—The pulp is delivered into a closed tank under subatmospheric pressure, and the stream is struck by a rapidly rotating toothed wheel which projects it violently against a target.—A.P.-C.

Cylinder De-Watering Device for Pulp, Paper Stock, Ground Wood and Similar Materials. A. Andersen, & A. Schie, Borregaard. Ger. pat. 655,268 (March 4, 1936).—Hydrostatic head is used only for causing the flow of stock through the cylinder wire covering and a roll pressing against this wire couches off the de-watered stock.—J.F.O.

N. E. TAPPI Discusses Paper Machines

The New England Section of the Technical Association of the Pulp and Paper Industry met at the Roger Smith Hotel, Holyoke, Mass. on Friday evening, January 19, 1940. R. H. Doughty of the Fitchburg Paper Company presided as Chairman.

The guest speaker was G. A. Peterson, sales manager of Rice, Barton & Fales Company, Worcester, Mass., who talked on "New Developments and Designs of Papermaking Machines." Mr. Peterson reviewed the highlights and developments which have taken place in the paper machinery industry in the last ten years. During that time they have had good opportunity to work on refinements in new equipment and these improvements are at present in operation.

In the manufacture of practically every type of paper, production has increased 50 per cent and to accomplish this machine speeds have been increased, not by radical changes in manufacturing machines, but by refinements of machine design. In addition advancements have been made in technical control of processes with considerable new control apparatus. These have been very important contributing factors.

Improved refinements as they apply to paper machines have occurred in every part of the machine. They started at the flow box, then to the slices, the shake, the suction boxes, the dandy roll, the suction couch roll and the suction press rolls.

In the dried section improvements have been made with anti-friction bearings, guide rolls for wires and presses, various drier drainage systems as well as the Minton vacuum driers, particularly for pulp machines. The coating of paper on the Fourdrinier machine,—an interesting development—shows many possibilities along this line.

New equipment for the control of moisture as well as temperature have been notable advances in machine operation. Very important advances have been made in the design of rolls on the machine. These have included various types of table rolls, wire guide rolls, press rolls and couch rolls. The manufacture of drying rolls also has been considerably improved. Advancements in the hypoid and electric drive have been made. Variations in the design of calenders with better rolls and air pressure controls are interesting. Improvements in winders as well as the advantage of the Pope reel were mentioned as definite aids to increased production.

Mr. Peterson explained in detail the McDonnell type Fourdrinier which is believed to be the greatest advancement in paper machine design. A moving picture was shown of both the Pope reel and the McDonnell type of Fourdrinier.

Those present included: R. H. Doughty, G. A. Peterson, L. W. Crouse, Paul Knight, John J. Burke, John Seastrand, N. M. Kennedy, Frank H. Leonard, Frank Massey, H. T. Barker, W. A. Nivling, C. P. Slocum, H. L. Mellen, P. S. Bolton, Parker B. Holden, L. B. Tucker, C. O. Duston, Fred W. Schneider, E. O. Nash, L. N. Smith, H. A. Otto, R. F. Irwin, Benjamin Collison, Helen U. Kiely, Lena E. Kelley, T. L. Stirling, John R. Lynskey, Harold R. Miller, D. J. MacIntyre, Anthony Bihhesimo, Engelbert Krichels, George Wellspeak, O. F. Hutchinson, Herman L. Berg, John M. McGarry, A. W. Neubauer, E. O. Reed, C. C. Mockridge, W. L. Foote, P. J. Slowey, Francis Gillespie, Edwin Bieniek, Claude Smith, John Studeny, John Kennedy, Andrew Jackson, Vincent Tranfaglia, Albert Dyson, John T. Leecock, Thomas Flaherty, Charles Davidson, P. S. Sinclair, W. J. Burke, C. L. Reece and L. R. Frisbie.

TAPPI to Discuss Color Names for Paper

The Optical Properties Committee has invited Deane B. Judd, physicist at the National Bureau of Standards, to discuss the application of the color designation system of the Inter-Society Color Council at the TAPPI annual meeting. Dr. Judd will present his paper on Wednesday morning, February 21, 1940. "Blue book" names of the Groundwood Paper Manufacturers Association will be compared with the corresponding ISCC color names. Further comparisons are to be made with traditional paper-color names. The talk will be illustrated by lantern slides and there will be an exhibit of colored papers under artificial daylight illumination.

The ISCC method of designating colors was described in the September 1939 issue of the Journal of Research of the National Bureau of Standards and is now available in reprint form as Research Paper RP 1239 at 10 cents a copy from the Superintendent of Documents, Washington, D. C.

The Identity of Resin Acids

I. Pinabietic Acid of Finnish Tallol

By Torsten Hasselstrom,[1] John D. McPherson[2] and Sam Hopkins, Jr.[2]

Abstract

Pinabietic acid, the terminal resin acid of Finnish tallol was originally discovered by Aschan. As a result of extensive investigations of Aschan and coworkers, it is assumed that this acid is structurally identical with and a steroisomer of the Levy abietic acid, obtained by means of vacuum distillation of American rosin and subsequent fractional crystallization of the distillate. This paper presents evidence that the pinabietic acid is not a chemical individual, but a mixture of at least three or four resin acids if the presence of d-pimaric acid is considered. Our earlier investigations have detected this acid in the secretion of Scandinavian pine and spruce. We have found the pinabietic acid to be a mixture of Steele's abietic acid, dehydroabietic acid and dihydroabietic acid and that these different constituents cannot be separated by fractional crystallization alone. We assume that the variations in optical rotation of the different fractions of pinabietic acid obtained throughout our work are due to varying amounts of dihydroabietic acid and dehydroabietic acid, both of the positive sign of rotation and which separate as contaminations together with the Steele's abietic acid of the negative sign of rotation. It is also maintained that resin acids containing the Steele's abietic acid are highly unstable when exposed to oxygen, in contrast to rosins rich in dehydroabietic acid but devoid of Steele's acid.

Theory, Procedure and Results

In the distillate of Finnish tallol, Aschan and collaborators isolated an abietic acid which they named pinabietic acid, *(1 and 2)*. As a result of their extensive investigations it is assumed that this acid is structurally identical with and a steroisomer of the Levy abietic acid *(3)*, obtained by means of vacuum distillation of American rosin and subsequent fractional crystallization of the distillate *(4)*. Later investigations in the resin acid series have proven, however, that rosin is a mixture of "abietic acid" in various stages of transformation together with d-pimaric acid. Due to this fact, it is possible only with greatest difficulties to isolate an individually pure abietic acid.

The original resin acid, sapietic acid (1-pimaric acid) *(5)* of the abietic type in the tree secretions is easily isomerized by heat, by acids or alkali to abietic acid. When this conversion is carried out at closely controlled conditions according to Dupont, Desalbres and Bernette *(6)* or more conveniently by the combined methods of Steele *(7)* and Palkin and Harris *(8)*, an abietic acid is obtained which satisfies the customary requirements for a pure chemical individual as to constant optical rotation. When abietic acid is heated at elevated temperatures, dehydrogenation and disproportionation of hydrogen occurs in the abietic acid molecule, whereby abietic acid is converted into a mixture of dehydroabietic acid, $C_{20}H_{28}O_2$; dihydroabietic acid, $C_{20}H_{32}O_2$; and tetrahydroabietic acid, $C_{20}H_{34}O_2$. This reaction was recently clarified by Fleck and Palkin *(9)* and by Littman *(10)* who obtained the evidence by fractional crystallization of the methyl esters of heat treated abietic acid, and by us *(11, 12, 13 and 14)* by action of concentrated sulphuric acid on heat treated rosin whereby dehydroabietic acid is sulphonated to form a sulphonate and the dihydroabietic acid, hydrated to produce a lactone of hydroxytetrahydroabietic acid, all of which compounds are easily identified.

In view of the fact that Aschan *et al.* did not succeed in obtaining a pinabietic acid of constant melting point and optical rotation *(15)*, and that we in some of our earlier work on American tallol had isolated the Steele's abietic acid *(5 and 16)* not previously recorded present in Finnish tallol, we found it necessary to reinvestigate the pinabietic acid for identity. In our present investigation we did not attempt to isolate the d-pimaric acid which we previously detached as dihydropimaric acid from the secretions of southern pines as well as Scandinavian pine and spruce *(5 and 17)*.

A sample of crude pinabietic acid was subjected to fractional crystallization substantially according to Aschan *et al. (2)*. The main fractions were then sulphonated according to Hasselstrom *(11)*. Since the sulphonation product yielded dehydroabietic acid sulphonate, identified as its dimethyl ester, and the lactone of dihydroabietic acid, it was proven that pinabietic acid of Finnish tallol contains dehydroabietic acid and dihydroabietic acid.

The resin acids in mother liquors of the second fraction were converted in the acid sodium salt $C_{19}H_{29}COONa \cdot 3C_{20}H_{30}O_2$ according to Palkin and Harris *(8)* and then recrystallized to constant optical rotation. The product thus obtained, the acid regenerated therefrom and the subsequently prepared di-n-amylamine salt and the again liberated acid did not differ from the Steele-Palkin-Harris abietic acid and corresponding derivatives of same. This concludes the evidence that the pinabietic acid of Finnish tallol also contains the Steele's abietic acid.

The last fraction of the pinabietic acid crystallizations, 0.6 per cent of the original starting material, was converted into di-n-amylamine salt. This salt and the recovered acid prepared therefrom did not show any constancy in melting point or optical rotation. This leads us to believe that the highest melting fraction of pinabietic acid in addition to the Steele's abietic acid, and dehydroabietic acid contains small amounts of the dihydroabietic acid of Ruzicka et al. *(18)* or Hasselstrom et al *(19 and 20)*.

Great variations in optical rotation have been observed throughout this work and particularly in the recovered acid fractions from the di-n-amylamine salt of the highest melting part of the pinabietic acid.

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[2] G. & A. Laboratories, Inc., Savannah, Ga.

[3] Trade name of the G. & A. Laboratories, Inc., Savannah, Georgia.
[4] The stabilization of the resin acids of tallol will be the subject matter of a separate publication.

This is due presumably to the fact that dehydroabietic acid *(21 and 22)* and dihydroabietic acid *(23)* (both of the positive sign of rotation) separate together with the Steele's abietic acid (negative sign of rotation) in amounts depending on the concentrations of solutions used in recrystallizations.

The results of this investigation shows that the pinabietic acid of Finnish tallol is not a chemical individual but a mixture of at least three or four different resin acids if the presence of d-pimaric acid is considered, and, furthermore, that these acids can not be separated by fractional crystallization alone.

It is well known that the resin acid mixture of tallol is highly unstable and we assume this is due to the Steele's abietic acid present. This is concluded by the fact that Steele's abietic acid, tallol resin crystals and ordinary rosin increase in weight rapidly, when exposed to oxygen, whereas dehydroabietic acid or rosins rich in this acid but devoid of Steele's abietic acid, such as Galex[3] from rosin or from tallol[4] are highly stable.

Experimental

CRYSTALLIZATION:

The crude pinabietic acid was recrystallized substantially according to Aschan *(15)*. The melting point and the optical rotation were determined on the different fractions as shown in Table I.

Dehydroabietic acid sulphonate: One part by weight of the pulverized pinabietic acid crystals and five parts by weight of sulphuric acid, sp. gr. 1.84, were mixed at 0 to + 10 deg. C. and stirred for half hour, and then poured into ice-water. The brownish precipitate was washed with cold water until the washings clouded when mixed with the original liquor, and the washed precipitate was then extracted three times with boiling water. The aqueous extract when evaporated to a small volume deposited crystalline dehydroabietic acid sulphonate on cooling, which was dried to constant weight and then converted into the dimethyl ester for identification. The yield on dehydroabietic acid as sulphonate in the terminal fractions of pinabietic acid are indicated in Table I.

Dimethyl ester of dehydroabietic acid sulphonate: Five parts by weight of dehydroabietic acid sulphonate was neutralized to phenolphthalein with a dilute aqueous solution of sodium hydroxide and the whole was evaporated to dryness. The pale yellowish powdered residue was dried for 2 hr. at 125 deg. C. and then boiled for 10 min. with 30 parts by weight of methyl sulphate. After cooling, the clear dark solution was poured into ice water and then the mixture boiled for about 1 hour. The separated dimethyl ester was removed, washed with a hot, dilute solution of sodium bicarbonate and then with water. It was recrystallized from acetone and methanol, the white silky needles melting at 176.7-177.7 deg. C., corrected.

When mixed with an authentic sample of the dimethyl ester of dehydroabietic acid sulphonate *(14)*, the melting point was not lowered.

Lactone of hydroxytetrahydroabietic acid: The brownish semi-solid residue from the preparation of dehydroabietic acid sulphonate was dissolved in acetone. The solution was allowed to stand, the separated crystalline lactone collected, the yields of which are indicated in Table I. After recrystallization from acetone, it melted at 130-131 deg. C., corrected and did not lower the melting point when mixed with an authentic sample *(13)* of this material.

TABLE I.—RECRYSTALLIZATION OF PINABIETIC ACID

Fraction	Solvent	Yield (starting material), g.	$(\alpha)_D$, deg.	Melting point (corr.), deg. C.	$C_{20}H_{30}O_2$ as sulphonate, per cent	$C_{20}H_{30}O_2$ as lactone, per cent
		3000	+21.0**	135-145	9	5
1	Methyl alcohol..	1475	—19.8	161.5-163.5	18	4
2	Methyl alcohol..	890	—24.35	164	16.2	2.9
3	Acetone	365	—28.06	168-172		
4	Acetone	180	—36.5	170-173.5		
5	Acetone	34	—44.65	180.5-182	5.8	2.5
6	Acetone	23		182-184		
					(The combined crystals from mother liquors	
7	Ethyl acetate ...	18.5		186.5-189.5	7; 8; 9, m.p.	
8	Ethyl acetate ...	16.5	—54.6	187-191.5	176-80 deg. C; $(\alpha)_D$ —45.6 were	
9	Acetone	12	—53.1	190-196	8.8	1

* All optical rotations were determined at room temperature 35-38 deg. C., in Savannah, Georgia during August 1939.

All rotations were taken in ethanol, and in 1 per cent solutions.

** Due to the yellowish color of the solution, the specific rotation could not be obtained with desired accuracy. The high positive sign of rotation of this fraction is apparently due to the d-pimaric acid which, on further recrystallization of the solids, is separated in the mother liquors. This assumption was concluded from a previous observation of ours *(3)* that when the sapinic acids are isomerized to Steele's abietic acid, the abietic acids may be removed by crystallization but the mother liquors contained the d-pimaric acid.

The Isolation of Steele's Abietic Acid From Pinabietic Acid

The mother liquors from the second fraction from the recrystallization of pinabietic acid were converted into the quarter sodium acid salt by adding the calculated amount of sodium hydroxide in alcoholic solution. After standing over night, the precipitated crystals were subjected to recrystallization from methanol, by procedure of Palkin and Harris *(8)*. In order to get a true comparison on the data obtained in the above operation, the Steele - Palkin - Harris abietic acid was prepared from gum rosin. The results of these tests are shown in Table II.

Preparation of di-n-amylamine salt of Steele's abietic acid: A solution of 4 parts by weight of acid and 100 parts by volume of acetone was treated with 3 parts by weight of di-n-amylamine in acetone. The

TABLE II.—COMPARISON BETWEEN STEELE'S ABIETIC ACID MADE FROM PINABIETIC ACID AND FROM ORDINARY ROSIN

Product	No. of cryst.	Melting Point (corr.), deg. C.	$(\alpha)_D$ (in ethanol), deg.	Mixed melting point test
1. Quarter sodium pinabietic acid salt from the mother liquors of fraction 2—Table I	11	203-205	—95.1	No depression with (5)
2. Liberated acid from (1)	1	160-163	—90.5	No depression with (6)
3. Di-n-amylamine salt from (2)	4	141-143	—58.6	No depression with (7)
4. Liberated acid from (3)	1	163-165	—79.9	No depression with (8)
5. Quarter sodium abietic acid * Salt from gum rosin	6	200-203	—97.2	
6. Liberated acid from (5)	1	164-167	—93.2	
7. Di-n-amylamine salt from (5)	4	141-143.5	—57.8	
8. Liberated acid from (7)	1	161-165	—80.8	

* The data given by Palkin and Harris for the purified Steele's abietic acid from gum rosin were as follows: $C_{19}H_{29}COONa \cdot 3C_{20}H_{30}O_2$, m.p. 205-208 deg. C. $(\alpha)_D$ —97 deg., abietic and acid, m.p. 171-173 deg. C. di-n-amylamine salt, m.p. 141-142 deg. C., $(\alpha)_D$ —74.5 deg.

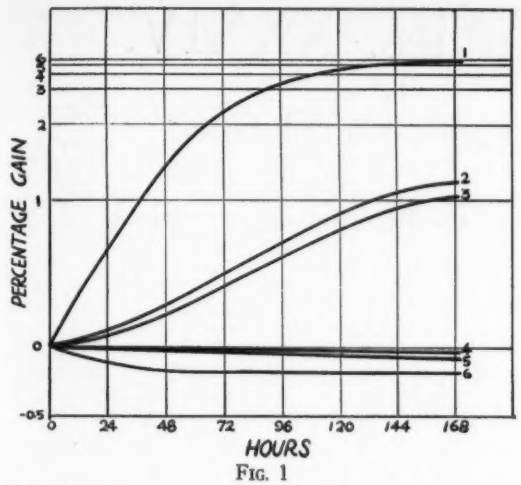

FIG. 1

Result of Oxygen Absorption Test. 1. Steele's Abietic Acid. 2. Gum Rosin. 3. Pinabietic Acid. 4. Dehydroabietic Acid. 5. Galex from Tallol. 6. Galex from Rosin.

solution was boiled for about 10 min. and filtered. On standing, the di-n-amylamine salt separated and was recrystallized from acetone.

The di-n-amylamine salt was prepared from pinabietic acid as well as from Steele's abietic acid from rosin for comparison. The results are indicated in Table II.

Liberation of Steele's abietic acid from the quarter sodium salt and from di-n-amylamine salt: A sample of salt was dissolved in ethanol and a little more than the calculated amount of hydrochloric or sulphuric acid was added and the acid recrystallized from methanol. The results of this preparation is indicated in Table II.

Mixed Melting Points

No melting point depression was observed in the mixed melting point test in the corresponding fractions of Steele's abietic acid and derivatives as indicated in Table II.

Investigation of pinabietic acid melting at 190-196 deg. C., corrected $(\alpha)_D$ *—53.1 deg.:* The highest melting fraction of pinabietic acid, fraction 9, Table I, was converted to di-n-amylamine salt and this subjected to fractional recrystallization. The abietic acid from the purified di-n-amylamine salts as well as from the mother liquors was liberated and recrystallized. The results of these operations are combined in Table III. No chemically pure abietic acid was secured by this treatment.

Oxygen Absorption Tests of Resin Acids Tallol, Dehydroabietic Acid, Steele's Abietic Acid, Gum Rosin, Galex From Rosin and Galex From Tallol

A 5 g. sample of each of the above materials collected on a watch glass, was kept in a stream of oxygen for 168 hr. and the weight increase recorded every 24 hr.; and indicated in Fig. 1 from which follows that the Steele's abietic acid containing materials which are unstable, such as tallol resin acids and rosin, whereas products rich in dehydroabietic acid but devoid of Steele's abietic acid are highly stable, such as Galex made from rosin and Galex made from resin acids of tallol.

The origin of materials used in the oxidation test were as follows: the Steele's abietic acid was made from gum rosin and purified according to Palkin and Harris *(8);* ordinary gum rosin was used in this test; the pinabietic acid was obtained by recrystallizing crude pinabietic acid twice from methanol; the dehydroabietic acid was prepared from dehydroabietic acid sulphonate by hydrolysis with dilute sulphuric acid according to Fieser and Campbell *(22);* ordinary rosin was used for making of Galex, crude tallol was used for making of Galex tallol rosin. The physical characteristics of these products are incorporated in Table IV.

Acknowledgement

Our thanks are due to Ab. Nordiska Föreningsbanken, Helsinki, Finland for securing a sample of pinabietic acid from Enso-Gutzeit Oy., Kotka, Finland.

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TABLE III

	Di-n-amylamine Salt of Pinabietic Acid, m.p. 190-196 deg. C. (corr.)				Liberated Acid			
No. of cryst.	Solvent	Yield, g.	Melting Point (corr.), deg. C.	$(\alpha)_D$ (in ethanol), deg.	No. of cryst.	Melting point, deg. C.	$(\alpha)_D$ (in ethanol), deg.	
1	Acetone	12.5	129-130	—36.5	1	183.5-186.5	—63.5	From mother liquors
2	Acetone	10	129.5-130.5	—39				
3	Ethanol	6	132-133	—42.6	1	189-194	—57.2	From mother liquors
4	Ethanol	4	132-132.3	—42.3	1	189-190.5	—87.0	
					2	183.5-186.5	—76.0	

TABLE IV.—PHYSICAL CHARACTERISTICS OF MATERIALS USED IN THE OXYGEN ABSORPTION TEST

	Melting point (corr.), deg. C.	$(\alpha)_D$ (in ethanol), deg.	
Steele's abietic acid	164 -167	— 93.2	Liberated from sodium tetraabietate $(\alpha)_D$ —97.2
Pinabietic acid	164.5-169	— 23.7	Twice crystallized from methanol
Gum rosin	81	+ 11.6	M.P. by A.S.T.M. ball and ring method
Dehydroabietic acid	169 -172	+ 72.7	By hydrolysis of dehydroabietic acid sulphonate
Galex from rosin	67	+ 32.6	M.P. by A.S.T.M. ball and ring method
Galex from tallol	173 -175	+ 54.1	

Instrumentation Studies. XXXIV.

Penetration of Papers by Liquids and Solutions*

Part I. General Discussion of the Phenomena

By The Staff of The Institute of Paper Chemistry

Abstract

Current theoretical descriptions of the flow of liquids and solutions through such porous and fibrous materials as paper are summarized.

Tests employed to evaluate paper for various uses involving penetration by liquids and solutions are discussed in the light of these theories.

Introduction

The penetration of papers by liquids and solutions is a process of general interest to the whole paper industry. It is a process of particular importance to some divisions of the industry, e.g., to the manufacturers of impregnating papers and of greaseproof papers. Whether the aim is a paper which is rapidly and completely permeated by a particular liquid, a paper which is as impermeable as possible, or a paper of intermediate characteristics the development and manufacture of that paper should be facilitated and expedited by intelligent consideration and application of existing knowledge of penetration processes. Tests intended to evaluate paper for a particular use must be designed with care in order to simulate, if not duplicate, the penetration phenomena occurring in actual use. Last, but not least, similar intelligent consideration must be given the penetration processes obtaining in the use of the paper, e.g., the relationship of ink to paper in printing.

The first section of this report discusses the essential theoretical aspects of penetration processes and whenever possible points out their significance in practice. The second section deals with the several types of tests used to evaluate papers for uses involving their penetration by liquids or solutions.

A comprehensive bibliography seems unnecessary in view of the complete coverage of the literature through 1938 already available elsewhere *(1)*. The references given in this report are in general to publications appearing since 1937 and to publications in fields not related to papermaking.

Theoretical Aspects of the Penetration of Paper by Liquids and Solutions

The porous nature of paper inescapably suggests that the movement of liquids into and through paper be considered in terms of capillary systems. The actual structure of paper is, of course, not accurately or even adequately described by any simple picture of a system of capillaries of varying radii. The pores in the sheet through which liquids move are, in general, not even approximately tubular in nature but are more of the nature of the interstices of a compressed brush heap. However, in spite of the actual complexity of the pore system of a sheet of paper, it is recurrently hoped that the relationships describing simple capillary flow will be found applicable to the flow of liquids into and through paper. The conditions under which these simple relationships are valid will now be discussed, and the possible effects of deviating conditions will be considered. Thereafter, the more statistical methods of describing penetration will be mentioned.

Laminar and Turbulent Flow through Cylindrical Capillaries: The flow of liquids through a capillary, as through a pipe, may be either laminar or turbulent. The flow is laminar if the directions of the stream lines through any cross section of the channel do not change with time; the flow is turbulent if the directions of the stream lines are not constant. Experiment has shown that the type of flow is determined by the speed of flow, by the geometry of the channel, and by the kinematic viscosity (the ratio of the coefficient of viscosity to the density) of the liquid. It is customary and convenient to express the relationship between these quantities by means of the following equation developed by Reynolds:

$$vd = k\nu, \qquad (1)$$

in which v is the speed of flow; d is some dimension of the channel, e.g., the diameter; k is a dimensionless quantity called the Reynolds number; and ν is the kinematic viscosity of the liquid. The value of the Reynolds number for a given situation is determined by this equation. It is apparent that for a given system, i.e., a particular capillary and a particular liquid, the Reynolds number depends upon the speed of flow. It is found experimentally that the flow of a liquid through a cylindrical capillary is turbulent for Reynolds numbers greater than about 2000 and is laminar for Reynolds numbers less than 2000. This limiting value is called the critical Reynolds number. The value of the critical Reynolds number varies with the geometry of the channel, e.g., for the flow of liquids through sands the critical value is unity *(2)* instead of 2000 as it is for cylindrical tubes. If it is assumed that the pores in paper are more like those in a body of sand than like cylindrical capillaries, and if the critical Reynolds number is assumed to be unity, the critical speed of flow of water is found (from equation 1) to be one centimeter per second for pores having diameters as large as 0.1 mm. Since larger values of the critical Reynolds number, smaller pore diameter, and larger kinematic viscosities yield larger critical speeds of flow, it appears safe to assume that the flow is laminar in any penetration of liquids into and through paper.

Laminar Flow through a Cylindrical Capillary:

* Part II of this series appeared in *Paper Trade J.* 105, no. 26:35-42 (Dec. 23, 1937); Part III appeared in *Paper Trade J.* 109, no. 15: 19-24, 26 (Oct. 12, 1939).

Mention of capillary flow most commonly suggests Poiseuille's law, i.e.,

$$U = (\pi R^4 P t)/(8\eta L)$$
$$\text{or, if } V \equiv U/t$$
$$V = (\pi R^4 P)/(8\eta L). \quad (2)$$

U is the volume of liquid which flows out of a section of length L of a long straight capillary of constant internal radius R in time t when the pressure difference between the ends of the section is P. η is the coefficient of viscosity of the liquid. The section of the capillary under consideration must be far enough from the ends of the capillary that no specific effects due to the ends of the tube influence the flow through the section, i.e., steady laminar flow must occur. Because of the "end effects," Poiseuille's law does not apply accurately to the flow through a capillary of total length L, i.e., to flow through a capillary connecting two reservoirs of liquid. These end effects are discussed in detail in a number of publications *(3)* on viscometry and will only be enumerated here.

The derivation of Poiseuille's relationship involves the assumption that the energy supplied to the flowing system through the pressure difference P is entirely dissipated through frictional forces and converted into heat. When the capillary connects two reservoirs, this is not the case, and part of the energy is used in changing the speed of flow at the inlet, which energy is lost in turbulence at the outlet of the capillary. The correction for this effect depends on the rate of flow and seems to be entirely negligible for the rates of flow found in the transudation of paper by liquids.

Another end effect is the influence of the shapes of the extremities of the capillary in determining its effective length. The effective length depends upon the distance from the inlet at which the flow becomes steady and upon the distance from the outlet at which the flow ceases to be steady and laminar. The magnitude of this influence is difficult to estimate for irregularly shaped openings and for very short capillaries.

The average speed of flow is often of interest and is obtained by dividing the volume rate of flow ($V = U/t$) by the cross-sectional area of the capillary. It is

$$v = (R^2 P)/(8\eta L). \quad (3)$$

The accuracy with which this relationship applies to a particular situation is influenced by the end effects mentioned above.

Laminar Flow into a Cylindrical Capillary: The discussion above applies to flow through a capillary which is completely filled with liquid. Another situation of interest is that of flow into a capillary when only one end is in contact with the liquid and the front of the liquid column is advancing into the previously empty capillary. Discussions of this situation commonly start with equation 3 for average speed of flow by assuming that the speed with which the liquid front is advancing at any time is given by that expression. L is taken to be the length of the uniform capillary which is filled with liquid at the moment of interest. From this relationship an expression is derived as follows:

$$v = d L/dt = (R^2 P)/(8\eta L);$$
$$\int L\, d L = \int [(R^2 P)/(8\eta)]\, dt;$$
$$L^2 = (R^2 P t)/(4\eta). \quad (4)$$

giving the dependence of the length of the filled capillary upon the elapsed time of flow. P represents the sum of the externally applied pressure difference, the hydrostatic head of the liquid, and the pressure due to capillary forces at the advancing liquid-air interface. It is assumed that P does not depend on L and t. The pressure due to capillary forces is given by the familiar equation

$$p_c = (2T \cos \theta)/R,$$

in which T is the surface tension of the liquid and θ is the angle of contact between the liquid and the capillary wall. Thus equation 4 may be written in expanded form as

$$L^2 = [R^2 (p_e + 2T \cos \theta/R)\, t]/(4\eta), \quad (5)$$

p_e being the externally applied pressure difference plus the pressure due to hydrostatic head.

A situation of particular interest arises when no external pressure is applied and flow into a horizontal capillary takes place under capillary forces alone. Equation 5 becomes, for this special case,

$$L^2 = (T R t \cos \theta)/(2\eta),$$
$$\text{or, if } \gamma \equiv T \cos \theta,$$
$$L^2 = (\gamma R t)/(2\eta). \quad (6)$$

Another particular situation of interest is that in which liquid flows into a vertical capillary under capillary forces alone. For this case equation 4 cannot be used directly since its derivation assumed P to be independent of the filled length of the capillary. In this case

$$P = (2\gamma/R) - L D g. \quad (7)$$

Substituting this value of P in equation 3, we have

$$v = [(2R\gamma - R^2 L D g)]/(8\eta L), \quad (8)$$

in which D is the density of the liquid and g is the gravitational acceleration. Every quantity in the right-hand member of equation 8 is constant except L, which is initially zero and continuously increases with time to a maximum value, the equilibrium capillary rise. The speed of flow is very large at the start but decreases rapidly and then gradually falls to zero as the capillary rise slowly approaches the equilibrium value for the particular capillary and liquid. This equilibrium height of rise is given by

$$L = (2\gamma)/(R D g). \quad (9)$$

The general relationship between height of rise and time of flow was calculated by Washburn *(4)*. It is rather complicated,

$$t = -\frac{8\eta L}{R^2 D g} + \frac{16\eta \gamma}{R^3 D^2 g^2} \log_e\left[1 - \frac{D g L}{2\gamma/R}\right].$$

and is seldom of interest. However, for the early stages of the flow when $R^2 L D g$ is small compared with $2R\gamma$ and may therefore be neglected, the general relationship reduces to one identical with equation 6.

These equations apply accurately if the end effects mentioned in the discussion of Poiseuille's equation are considered in these equations for the flow of liquid into a capillary. The effective length, L, which is filled with liquid depends upon the shape of the entrance to the capillary. The actual magnitude of the correction to be applied to the apparent length is difficult to estimate; it becomes increasingly important as the length L decreases.

Fresh consideration must now be given the matter of the type of flow involved in this penetration of liquid into a capillary. Equation 3 shows that the

speed of flow is inversely proportional to the length of the capillary. Therefore, as the liquid enters the capillary the length L is very short and the speed of flow is very large; the flow is turbulent until the filled length of the capillary is such as to yield a speed of flow equal to or less than the critical value corresponding to the critical Reynolds number. Equations 4, 5, or 6 do not apply until the flow is laminar. Washburn *(4)* has calculated these distances of penetration (L_o) at which the flow becomes laminar. His formula is the following:

$$L_o = \frac{\left[P + \frac{2T \cos \theta}{R}\right] R^3 D}{4\eta^2 k}, \qquad (10)$$

in which P is the externally applied pressure difference minus the pressure due to hydrostatic head of the liquid in the capillary; it is the externally applied pressure for a horizontal capillary. The other symbols have the significance previously assigned. The following table is calculated from Washburn's formula for the case of water; the critical Reynolds number, k, being taken equal to 2000.

DISTANCES OF PENETRATION, L_o, BEFORE LAMINAR FLOW BEGINS

R (mm.)	0.1	0.01	0.001	0.0001
L_o (mm.) P = 1 atmos.	13	0.013	0.000015	0.000000033
L_o (mm.) P = 0	0.02	0.0002	0.000002	0.00000002

It appears from the table that the flow of water becomes laminar within a very short distance from the end of a fine capillary. The effect of this turbulence at the beginning of the flow is therefore negligible when the filled length of the capillary is large as compared with the distances L_o. For many liquids of interest the surface tension is smaller and the viscosity is larger than for water; it follows from equation 10 that the distances L_o are therefore smaller than for water, e.g., for castor oil flowing under capillary forces alone, the distances are roughly one-millionth of those listed in the table for water.

Flow through Combinations of Cylindrical Capillaries: As a step toward capillary systems of practical interest, it is profitable to consider several simple series and parallel combinations of cylindrical capillaries. A series combination of capillaries is one in which the liquid flows through each capillary in succession; the volume rate of flow is the same for each one.

Assuming the flow to be laminar and neglecting end effects and other corrections, consider the flow through a series combination of two capillaries having different lengths and different radii. The total pressure drop across the combination is the sum of the pressure drops across each one, viz.,

$$P = P_1 + P_2. \qquad (11)$$

Each pressure difference in equation 11 may be replaced by its equivalent expression obtained from Poiseuille's law, equation 2, with the following result:

$$P = [(L_1/R_1^4) + (L_2/R_2^4)](8\eta V)/\pi; \qquad (12)$$

η and V are the same for each capillary. The equivalent capillary is the single capillary through which the volume rate of flow, under pressure difference P, would be the same as that through the combination under the same pressure difference. The length and radius of the equivalent capillary are found by equating the right-hand member ot equation 12 to the corresponding expression for the equivalent capillary, i.e.,

$$\frac{8\eta V}{\pi}\left[\frac{L_1}{R_1^4} + \frac{L_2}{R_2^4}\right] = \frac{8\eta V L}{\pi R^4}. \qquad (13)$$

Hence,

$$\frac{L}{R^4} = \frac{L_1}{R_1^4} + \frac{L_2}{R_2^4}. \qquad (14)$$

The extension to the case of more than two capillaries in series is direct.

It is opportune to point out here that the dimensions of an equivalent capillary are not the averages of the dimensions of the individual capillaries. For example, let it be assumed, for simplicity, that the two capillaries above are of equal length, i.e., $L_1 = L_2 = L$. Then

$$L/R^4 = L\,[(1/R_1^4) + (1/R_2^4)]$$

and

$$(1/R^4) = (1/R_1^4) + (1/R_2^4). \qquad (15)$$

If we assume $R_1 = 1$ mm. and $R_2 = 0.1$ mm. and substitute in equation 15, then

$$\frac{1}{R^4} = \frac{1}{1} + \frac{1}{0.001} = 10{,}001.$$

Therefore, $R = 0.1$ mm. The average radius of the individual capillaries is 0.55 mm., a value which is 5.5 times greater than the radius of the equivalent capillary. The significance of this discrepancy is realized when it is remembered that the volume rate of flow is proportional to the fourth power of the radius, i.e., a single capillary having a radius equal to the average of the two would pass liquid almost 1000 times as rapidly as the equivalent capillary. If the two capillaries have the same radii but different lengths, it follows from equation 14 that the length of the equivalent capillary is the sum of the individual lengths.

We may now consider the situation resulting from the connection of the same two capillaries in parallel, i.e., with the same pressure difference across each one. The total volume rate of flow is the sum of the individual rates, viz.,

$$V = V_1 + V_2.$$

The application of equation 2 to each capillary yields

$$V = [(R_1^4/L_1) + (R_2^4/L_2)]\,(\pi P)/(8\eta). \qquad (16)$$

The equivalent capillary for this situation is the single capillary through which the volume rate of flow for pressure difference P is equal to the sum of the rates of flow through the individual capillaries. Writing Poiseuille's law for the equivalent capillary, replacing V in equation 16, and simplifying, one has

$$(R^4/L) = (R_1^4/L_1) + (R_2^4/L_2). \qquad (17)$$

The extension to a parallel combination of more than two capillaries is direct. It should be noted that this is not the mere reciprocal of equation 14.

Those versed in the subject of electricity will note from these examples that in series and parallel combinations, the ratio L/R^4 plays the role of electrical resistance.

The next step is to consider series and parallel combinations of capillaries. The procedure in a simple situation is to calculate the dimensions of an equivalent capillary for each group of capillaries which are connected in parallel and then to consider such equivalent capillaries to be connected in series with the remaining actual capillaries. The dimensions of the capillary equivalent to the entire collection is

calculated. Peek and McLean *(5)* have made such a calculation for an interesting situation. They considered the vertical rise of a liquid under capillary forces in a medium composed of series and parallel combinations of short capillaries whose radii were continuously distributed between two fixed limits; all radii between these limits were assumed to occur with equal frequency. For that situation they found the equation corresponding to equation 8 to be

$$v = (B\gamma)/(4\eta L) - (C\ D\ g)/(8\eta)\ . \qquad (18)$$

B and C are constants for the capillary medium and are dependent only upon the distribution of radii of the capillaries. It is interesting and important that this complicated network of capillaries requires no more complicated dependence of speed of flow on γ, L, and η than does a simple capillary.

Flow in Noncylindrical Capillaries: It is mathematically difficult to find relationships describing the flow through channels of unsymmetrical cross section. The analysis has been carried out for channels having elliptical, rectangular, and triangular cross sections *(6)*. For a channel of elliptical cross section, the R^4 of Poiseuille's equation (*see* equation 2) is replaced by $a^3b^3/(a^2 + b^2)$; a and b are semi-major and semi-minor axes, respectively, of the elliptical section. For other cross sections, the expressions giving the volume rates of flow are too complicated to be useful in the cases of practical interest here.

Dimensions of Equivalent Capillaries: In the case of a single glass capillary the radius may be determined by direct measurement, by calculation from the weight of thread of mercury of measured length, or by calibration from flow data. In the latter case, for example, the volume rate of flow of a liquid of known viscosity through a measured length of the capillary for a measured pressure difference might be found. By means of equation 2 the radius of the capillary could then be calculated; a more accurate calculation would involve the corrections mentioned in the section entitled *Laminar Flow through a Cylindrical Capillary* above. The value of the radius so obtained would be valid for use in any of the equations of the section entitled *Laminar Flow into a Cylindrical Capillary.*

In the case of a series and/or parallel combination of capillaries, however, the value of the equivalent radius found by measurements for one condition of flow does not necessarily apply for another condition of flow through the same combination of capillaries. The general situation may be illustrated by the following trivial example. Consider a medium composed of a parallel arrangement of a large number of capillaries, half of the capillaries having radii of 1 mm. and half having radii of 0.1 mm. As regards height of rise of the liquid under capillary forces, the equivalent capillary for such an arrangement might be considered as the one in which the height of rise would be equal to the average height of rise in the medium. The average rise in the medium is the average obtained by applying equation 9 to two capillaries of given radii.

$$\text{average } L = (2\gamma/D\ g)\ (1/2)[1/1 + 1/0.1] = (2\gamma/\ D\ g)\ 5.5$$

The equivalent capillary radius is then

$$R = 1/5.5 = 0.18 \text{ mm.}$$

However, the equivalent capillary radius which would describe the volume rate of flow through the medium, assuming the capillaries to be of equal length, would be given by equation 16, which yields the value $R =$ 1 mm. Thus the equivalent radius calculated by the first method would yield a rate of flow roughly one-thousandth of the actual value. While the corresponding errors involved in the application of capillary equations to porous materials may or may not be as large as those for this particular trivial case, care must be exercised when such situations arise.

Plastic Flow: Some liquids and solutions exhibit a change in viscosity with rate of flow. Others appear to require the application of a minimum stress before flow occurs. In either case, the flow of such liquids or solutions through a particular system cannot be described without a detailed knowledge of the structure of the channel through which the flow takes place and of the characteristics of the liquid. These effects are particularly apparent for some thixotropic inks and coating mixtures.

Theory of Wetting: A detailed discussion of wetting phenomena is not necessary for the purposes of this report; only the points of immediate interest will be considered. More complete considerations of the subject may be found in such publications as those of Osterhof and Bartell *(7)* and of Adam *(8)*.

In order that a liquid may spread spontaneously over a solid surface, it is necessary that the spreading process involve a decrease in the free energy of the system. The change in free energy during spreading is, in general, made up of three contributions; a loss of energy, S_{sa}, associated with unit area of the original solid-air interface; a gain of energy, S_{sl}, associated with unit area of the solid-liquid interface; and a gain of energy, S_{la}, associated with unit area of the air-liquid interface. This change in free energy may be expressed as

$$\Delta F = S_{sl} - S_{sa} + S_{la} \qquad (19)$$

The quantity $S_{sa} - S_{sl}$ is called the adhesion tension, A. The quantity S_{la} is numerically equal to the surface tension of the liquid, T. Hence, equation 19 may be written as

$$\Delta F = -A + T. \qquad (20)$$

In order that the change in free energy be negative, i.e., that the free energy decrease, it is clear from equation 20 that the adhesion tension must be greater than the surface tension of the liquid. If the change in free energy is positive, i.e., if A is less than T, spontaneous spreading does not occur; the liquid surface remains at rest making an angle θ with the solid surface. It is perhaps more convenient to express these relationships in terms of the ratio of the adhesion tension to the surface tension, K, so that

$$A = K\ T. \qquad (21)$$

Spontaneous spreading occurs if K is greater than one. If K is less than one, $K = \cos\theta$, and spreading does not take place.

In the particular case of capillary rise, "spreading" involves no change in the area of the air-liquid interface and, hence, the free energy change is determined by the adhesion tension alone. The condition that a liquid rise in the capillary is that A be greater than zero, i.e., that K be greater than zero, or θ be less than 90°. $T\cos\theta$ is the effective force per unit length of solid-liquid interface causing the capillary rise; its maximum value is T when $K = \cos\theta = 1$. If K is greater than one, the affinity of the liquid molecules for the solid surface is greater than their cohesion (for themselves); this may be considered to mean that the liquid molecules may spread over the

capillary surface faster than the liquid column rises.

The Penetration of Liquids and Solutions into Paper: As was mentioned at the beginning of this section, the actual structure of paper cannot be adequately pictured as a complex combination of capillaries. It seems that in most penetration processes the major part of the flow takes place through the spaces or pores between the fibers, rather than through the channels within the fibers. Permeation of the fibers themselves is generally a slower process than the penetration between fibers. The channels by which liquid passes through or along a sheet may consist of extremely irregularly shaped pores multiply interconnected by much smaller constrictions or orifices. Particularly in the case of the channels effective in penetration through a sheet, there can be little distinction between the lengths and the diameters of the pores. In other words, the actual channels are about as different as they can be from the ideal capillaries to which the relationships of capillary flow apply accurately. As is often the case, the justification for applying an over-simplified theory to a complex situation rests entirely upon the usefulness of the results obtained. Danger lies in reading out of the results an interpretation involving too much of the simple picture on which the theory was based and in drawing deductions of too far-reaching a nature.

Rarely is there interest in the steady flow of liquid through a sheet of paper. The interest is usually in the rate of penetration. Consider, for example, the application of equation 6 to the transudation of a sheet of paper by a liquid under capillary forces.

$$L^2 = (\gamma R t)/(2\eta) . \qquad (6)$$

In this case L is the thickness of the sheet and t is the time for transudation to take place. Since γ and η can be measured, and L and t are experimentally observed values, R (the effective capillary radius) is the only unknown quantity. The value of R, calculated from the equation above, is then the radius of the equivalent capillary, i.e., the cylindrical capillary of radius R into which the liquid would flow a distance L under capillary forces in the time t (assuming the same value of γ, i.e., same contact angle). This is the straightforward application of capillary theory. It is commonly found that the values of equivalent radii so calculated are very small as compared with the size of pores as seen by microscopic observation. However, there is no practical method of estimating the size or relative importance of the fine interconnections of the pores visible to the eye. The necessity for believing in these small radii can be evaded by considering the equivalent capillary lengths to be greater than the caliper of the sheet, in some cases many times greater, because of the tortuous nature of the actual channels.

Usually it is unnecessary actually to calculate the equivalent radii, as observations are made on different papers for the purpose of ranking them as to permeability to the liquid, e.g., oil in the conventional oil drop test. The time for transudation is used as a measure of the resistance offered by the paper to penetration by the oil. In terms of equation 6 this time, t, is given by

$$t = [(2\eta L^2)/T]\,[1/(R \cos \theta)]. \qquad (22)$$

R varies from paper to paper, while $\cos \theta$ may or may not. In any case, $1/R \cos \theta$ is characteristic of the paper and, according to capillary theory, should be a measure of the resistance to penetration by the liquid, since η, L (if the papers are of constant caliper), and T are constants. If the papers are not of the same caliper, the equation above indicates that correction for caliper differences may be made by multiplying the observed time for a particular paper by the ratio L_o^2/L^2, where L_o is some arbitrarily chosen standard caliper, e.g., unity. This operation reduces each observed time to the value which should be observed if the same paper were available in the standard caliper.

It is found experimentally that equation 23 often fits the data better than does equation 6.

$$L^n = (T \cos \theta R t)/(2\eta) . \qquad (23)$$

It has been found *(9)* in size tests on a considerable range of papers that n varies through fairly wide limits, with an average value of about 1.9. Carson *(10)* found $n = 2$ to be satisfactory for general caliper correction in size tests.

Since the fibers are preponderantly oriented with their lengths in the plane of the sheet, the channels effective in the flow along the sheet direction probably differ in size, shape, distribution, and number from the channels effective in flow through the sheet. Consequently, effective capillary radii found for flow in one direction should be used to describe flow in the other direction only with due cognizance of such possible differences. Similarly, the effective radii for flow along the grain direction of a sheet will, in general, differ from those for flow in the cross-grain direction. These differences in characteristics for the several directions of flow may be enhanced in the case of liquids which swell the fibers as compared to nonswelling liquids.

Although extensive measurements have not been made, it seems to be generally assumed that most liquids of interest in connection with paper display a zero angle of contact with paper. It is not known whether the adhesion tensions are such that the K of equation 21 is greater than unity. Foote *(11)* found the angle of contact between alcohol, formamide, or benzene and papermaking fibers to be zero. The angle of contact between water and sized fiber was, in general, greater than zero and increased with increasing degrees of sizing of the fiber.

It is clear that the channels will be affected by variations in moisture content of the paper and, therefore, studies of penetration must be carried on under controlled relative humidity, a well-known fact in practice.

The viscosity and surface tension of the penetrating liquid, as well as the moisture content of the paper, depend upon temperature. Therefore, the temperature must be controlled during the penetration process and corrections for temperature differences must be made when comparing penetrations of different papers which occurred at different temperatures. Equation 22 shows the time for penetration to a particular depth to be proportional to the viscosity and inversely proportional to the surface tension. Therefore, observed times of penetration at a given temperature may be reduced to the corresponding times at some standard temperature by the relationship

$$t_o = t(\eta_o/\eta)\,(T/T_o) , \qquad (24)$$

when the angle of contact is constant. The subscript o refers to quantities characteristic of the standard temperature. For many liquids the change in viscosity with temperature is considerably greater than that in

surface tension, and for small temperature intervals the change in surface tension may be neglected. As an indication of the magnitude of the changes involved, it may be noted that the viscosity of castor oil decreases by about nine per cent per degree centigrade increase in temperature.

None of the relationships discussed above can hold for the penetration of liquids exhibiting plastic or thixotropic properties. The rates and distances of penetration for such liquids should, in general, be less than those calculated from the formulas given, even for flow through ideal cylindrical capillaries. Such effects of thixotropy and plastic flow may be particularly important, e.g., for printing inks, impregnating mixtures, and coating compounds.

Liquids or solutions containing a component which is highly sorbed by the fibers or furnish of paper may not behave according to the simple relationships because of a continuous change in the adhesion tension of the liquid-furnish system as the highly sorbed component is progressively removed during penetration. Likewise, liquids or solutions containing components of different viscosities may exhibit a progressive change in effective viscosity as penetration proceeds because of a preferential sorption of one of the components.

There is a possibility, perhaps remote, that the finest constrictions in the channels may be decreased in effective cross section by sorption of particularly large molecules.

The evaporation of volatile components of a liquid may also change the adhesion tension and viscosity and so affect the penetration process. In addition, evaporation from the advancing liquid front may cause sufficient loss of liquid to change materially the apparent rate of penetration. This is believed to be true when water penetrates a very hard-sized paper.

Liquids containing dispersed material may show a complicated behavior because of the filtering-out of the dispersed material by pores near the surface of the sheet. The resistance to flow of the vehicle may thus be progressively increased as the effective cross sections of the surface pores gradually decrease, because of the accumulation of originally dispersed material. This effect plays some part in such processes as impregnating and printing.

There is no hope of being able to rank papers as to resistance to penetration by all liquids and solutions by carrying out tests with a single liquid. The resistance to penetration by various nonswelling liquids which show zero contact angle with paper and which show none of the specific effects mentioned above may possibly be judged by tests with a single liquid, or perhaps by measurement of the air porosity of the papers. Experimental evidence on this point is not available. It is difficult to make certain that these specific effects are absent, and, in fact, the best proof of their absence in a group of liquids would be the observation that the liquids behave similarly in penetration processes.

Statistical Descriptions of Penetration Processes: Thus far the discussion of penetration phenomena has been based on a detailed picture of a supposed mechanism of the passage of liquid through cylindrical channels. When it became necessary to discuss the actually complex structure of paper, equivalent capillaries were introduced in order to retain the relative simplicity of form of the expressions describing the flow of liquids in cylindrical capillaries. This simplicity of form, while comforting, is deceptive in that it encourages the drawing of unwarranted conclusions. Other methods of describing penetration processes have been used. These methods provide no picture of the mechanism; they deal only with experimentally observable quantities. The methods are essentially statistical since they consider only the ensemble of pores, not the individual pores.

The one-dimensional flow of liquids through sand beds is adequately described by Darcy's law, viz.,

$$V = (c\ A\ P)/L, \qquad (25)$$

where V is the volume rate of flow of liquid through the bed of cross-sectional area A and thickness L under pressure difference P; c is a constant characteristic of the particular sand bed and liquid. The applicability of this equation to the penetration of liquids through paper is immediate. A is the tested area of the specimen. L is the caliper of the sheet, and P is the pressure difference (due to externally applied pressure and/or capillary forces). The characteristics of the particular paper and particular liquid are all lumped into c. Different papers would be compared by comparing their values of c without inquiring into the size, shape, number, distribution or orientation of the actual channels through which the flow takes place. The constant c is often split into two constants, one characteristic of the medium, the other characteristic of the liquid. Thus

$$c = \mu/\eta.$$

μ is called the permeability of the medium; η is the viscosity of the liquid. The permeability defines the medium as far as penetration processes due to relatively large pressures are concerned. If the capillary forces are large compared with, or are comparable to, the external pressure, recourse must be had to capillary theory in order to calculate the value of P to be used in equation 25. It may be noted that this equation is analogous to the one describing the one-dimensional flow of heat, c playing the role of the thermal conductivity.

The penetration of liquids into various solids has also been described in terms of diffusion *(12, 13)*. The relationships are somewhat complicated mathematically, but they do not involve any deceptively simple pictures of the mechanism of the penetration process.

Discussion of the Evaluating Tests of Paper Which Involve Penetration by Liquids

The purposes of the various tests involving liquid penetration are diverse; for example, the turpentine test for greaseproof papers reveals the weak spots of the sheet, the Cobb test *(14)* nominally gives a measure of the average penetrability of the sheet, the Larocque Surface Oil Absorption Test *(15)* is intended to measure the initial rate of penetration, the kerosene test for the saturating capacity of roofing felts deals with the total quantity of liquid which the saturated sheet will hold, and the oil penetration test for rate of saturation of roofing felts yields the time which is required for essentially complete penetration of the sheet.

For the purpose of the following discussion the many tests have been grouped into a number of classes: tests involving transudation (complete penetration), tests involving only partial penetration of the sheet, and tests of rate of penetration. Each class is characterized by the particular penetration process involved rather than by the liquid used or by the particular purpose of the test. The following remarks deal only with the penetration phenomena; no general criticism of the validity or the usefulness of the tests

is given. Carson has given an excellent criticism of many of the sizing tests *(10)*.

Transudation Tests: An important group of the tests involving transudation of the sheet are the flotation tests. In these tests the specimen is floated on the surface of the test liquid and penetration proceeds under capillary forces alone. The experimental observation consists in noting the time after flotation at which a specified number of spots or a specified fraction of the specimen area show transudation. If a volatile liquid is used the end point may be delayed because of evaporation as the liquid advances into the sheet; such is particularly the case when the end point is judged by the appearance of specularly reflecting spots of liquid on the surface of the specimen or by the change in color of a dry indicator sprinkled over the upper surface of the specimen. This trouble is commonly minimized by covering the specimen with a plate of glass, a watch glass, or some similar deterrent to rapid evaporation. Volatility of the test liquid tends to advance the end point for some tests, for example, when some dry indicators are used. The vapor, which passes through the sheet faster than the liquid, causes some indicators to change before the actual arrival of the test liquid at the surface. Colored solutions are sometimes used as test liquids with the aim of making the visual end points more easily determined. The judgment of the end point is often facilitated but little, since the coloring matter is so selectively sorbed by the fibers at the surface of the specimen that it is essentially uncolored solvent which actually transudes the specimen. Pigmented and toned inks behave similarly, but, in addition, the pigment which is deposited at the surface may hinder the passage of the vehicle into the specimen. Rapid selective sorption of one component of a test liquid may appreciably change the adhesion tension and/or the viscosity of the liquid during the transudation; the result of the test would then be characteristic of neither the original solution nor the solution lacking the active component. This effect would be particularly important if papers of greatly differing calipers were ranked by the test. A pure liquid, therefore, is the ideal test liquid unless a use requirement dictates otherwise.

Essentially similar remarks apply to sand-pile tests, oil drop tests, and Penescope tests *(16)*. In the last case, the pressure causing the flow of liquid may be materially greater than that due to capillary forces alone because of the hydrostatic head of the test liquid.

Another group of tests involving complete penetration of the specimen are those in which the specimen is completely immersed in the liquid. A major criticism of such tests is that air is likely to be trapped within the sheet and cause erroneous results whether electrolytic conductivity, weight of saturating liquid, or some other quantity is measured.

Tests using interacting solutions (i.e., those in which one solution acts as the test liquid, and its transudation is indicated by the appearance of a typical color change when the second solution is applied to the opposite side of the specimen) are vulnerable with regard to selective sorption and to the effect of solutes in changing the effective adhesion tension because of special affinity for some constituent of the paper furnish.

Partial Penetration Tests: One group of tests which does not depend upon complete penetration of the specimen are those in which a drop of the test liquid is put on the surface of the specimen and the time for disappearance of the drop or the area over which the drop spreads is noted. In many of these tests the penetration of liquid along the sheet, as well as through the sheet, is important. The correlation between the penetrabilities in the two directions is not known. The relative importance of the penetration in the two directions will vary from paper to paper and the ranking of papers as regards penetrability in either direction is, therefore, questionable.

Tests which involve applying a dye solution or an ink to one side of the specimen for a specified time and then photometrically measuring the depth of dyeing or inking must be interpreted with caution because of the rapid sorption at the surface of the sheet. The depth of dyeing or inking may be no indication of the extent of penetration of the solvent or vehicle.

These tests as well as those which deal with the gain in weight of the specimen after contact with the test liquid for a specified time are difficult to interpret when applied to coated sheets or laminated specimens because of the unknown depth of penetration.

Rate of Penetration Tests: The most common test for rate of penetration is that of observing the rate of rise of liquid along a vertically mounted specimen. This test is particularly sensitive to trouble due to evaporation from the rising liquid, to selective sorption of active constituents, and to effects due to pigment or other dispersed material being deposited at the surface and so hindering the passage of liquid into the specimen. The specimen must be of ample width in order to eliminate any effects due to the cut edges. A serious objection to the test arises in some cases from the fact that there may be little correlation between the rate of rise along the strip and the rate of penetration of the same liquid through the specimen; it is the latter rate which is most often of interest.

It seems that the only test which yields the instantaneous rate of penetration of liquid through a sheet at a particular stage in the process is that described in Instrumentation Studies XVIII and XXVII *(17)*. This test was designed for the study of the penetration of oil through printing papers; it depends upon the change in the light transmittance of the specimen with depth of penetration. This test is open to the same criticism as the others if the test liquid is a solution or a complex liquid or if a coated or laminated sheet is tested.

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E. M. Sergeant Pulp & Chemical Co., Inc., *Delaware,* Hernosand, 300 bls. sulphite.
M. Sone, *Hallaren,* Iggesund, 2,100 bls. wood pulp.
Pagel Horton & Co., Inc.. *Hallaren,* Sweden, 4,425 bls. wood pulp.

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Bulkley Dunton Pulp Co.. Inc., *Hogland,* Oslo, 1,750 bls. wood pulp.
Cellulose Sales Co., Inc., *Hogland,* Oslo, 2,625 bls. wood pulp, 2,836 bls. dry pulp.
Brown Bros., Harriman & Co.. *Hogland,* Oslo, 8,700 bls. kraft pulp.
Pulp Sales Corp., *Nagu,* Viipuri, 5,320 bls. prime cellulose, 1064 tons; 463 bls. strong sulphite, 92 tons; 950 bls. prime bleached sulphate, 189 tons; 1,442 bls. prime strong sulphate, 258 tons; 2,568 bls. prime half bleached sulphate, 428 tons; 666 bls. prime strong sulphite, 133 tons.
Pulp Sales Corp., *Nagu,* Kotka, 3,844 bls. prime strong sulphate, 768 tons; 316 bls. prime bleached sulphite, 52 tons; 1,475 bls. prime bleached sulphate, 295 tons; 1,244 bls. prime strong sulphite, 207 tons.

NEWARK IMPORTS

WEEK ENDING JANUARY 20, 1940

Pulp Sales Corp., *Nagu,* Viipuri, 843 bls. prime strong wet sulphite, 160 tons; 266 bls. prime cellulose, 53 tons; 6,650 bls. prime strong wet sulphite, 1,236 tons.

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Atterbury Bros., Inc., *Toronto,* Drammen, 1,275 bls. dry chemical pulp.
The Borregaard Co., Inc., *Toronto,* Hurum, 2,664 bls. dry unbleached sulphite.
Atterbury Bros., Inc., *Toronto,* Tofte. 1,200 bls. dry bleached sulphite.
The Borregaard Co., Inc., *Toronto,* Bamble, 1,950 bls. dry bleached sulphate.
National Pulp & Paper Co., Inc., *Toronto,* Bamble, 121 rolls newsprint.
Price & Pierce, Ltd.. *Hjelmaren,* ——, 300 bls. unbleached sulphite.
Price & Pierce, Ltd., *Ravnefjell,* ——, 4,500 bls. unbleached sulphite, 3,300 bls. unbleached sulphate.

PHILADELPHIA IMPORTS

WEEK ENDING JANUARY 20, 1940

Scott Paper Co.. *Toronto,* Oslo, 500 bls. dry sulphite.
Atterbury Bros., Inc., *Toronto,* Drammen, 1,700 bls. dry chemical pulp.
Atterbury Bros., Inc., *Toronto,* Tofte, 3,000 bls. dry bleached sulphite, 2.100 bls. moist bleached sulphite.
Price & Pierce, Ltd., *Tortugas,* ——, 625 bls. bleached sulphite.
Continental Bank Trust Co., ——, Shanghai, 1,100 bls. old cotton rags.
Castle & Overton, Inc.. *Examiner,* Piraeus, 205 bls. rags.

BALTIMORE IMPORTS

WEEK ENDING JANUARY 20, 1940

Pagel Horton & Co., Inc., *Hjelmaren,* Sweden, 1,950 bls. wood pulp.
Price & Pierce, Ltd., *Alssund,* ——, 972 bls. unbleached sulphite, 4,110 bls. unbleached sulphate.

NEWPORT NEWS IMPORTS

WEEK ENDING JANUARY 20, 1940

Price & Pierce, Ltd., *Alssund,* ——, 8,940 bls. unbleached sulphite, 3,000 bls. bleached sulphate, 3,000 bls. unbleached sulphate.

NEW ORLEANS IMPORTS

WEEK ENDING JANUARY 20, 1940

Perkins Goodwin & Co., *Delaware,* Hernosand, 14,700 bls. dry sulphate.

LOS ANGELES IMPORTS

WEEK ENDING JANUARY 20, 1940

——, *Hokuroku Maru,* Shanghai, 280 bls. old cotton rags, 252 bls. rags.
——, *Hokuroku Maru,* Yokohama, 7 bls. paper.
——, *Asama Maru,* Kobe, 15 cs. transparent paper.
——, *Yamazuki Maru,* Buenos Ayres. 64 tons rags.
——, *Tokai Maru,* Osaka, 1 cs. paper, 3 cs. tissue paper.

New Literature

The power factor is discussed in Bulletin GEA-3225 issued by the General Electric Company, Schenectady, N. Y. The fundamentals of the subject are clearly presented for a clear understanding of this technical term which is one of the elements to be considered in relation to the cost of electric power. G E Pyranol capacitors for profitable power-factor improvement are described.

Alloy tubes are discussed in Bulletin 12-A issued by the Babcock & Wilcox Tube Company, Beaver Falls, Pa. It presents technical data on high-temperature steels and on B&W seamless alloy tubes and pipes for high pressure and high temperature services.

Flow meters for steam, liquids and gas are described in Bulletin 100-4 just issued by The Foxboro Company, Foxboro, Mass. It gives much useful information about flow meters. The contents include flow meters at work, types of meters and their functions, construction facts and values, and meter accessories.

Electrical measuring instruments are described in a 66-page condensed catalogue just issued by the Leeds & Northrup Company, 4934 Stenton avenue, Philadelphia, Pa. The company's entire line of instruments for research and for routine testing in laboratory, plant and field are listed and briefly described, such as standards, galvanometers and dynamometers, bridges, potentiometers, photometric apparatus, accessories and supplies.

Packless expansion joints of the U-ring type are described in Bulletin 35-50A, issued by the American District Steam Company, Tonawanda, N. Y. This Adso joint, for steam and hot water lines, is provided with an expansion element operating on the principle of cold springing used in the installation of pipe bends, and is furnished with flanged ends or with beveled ends for welding for pressures up to 300 pounds.

Indirect air heaters are described in Bulletin 74 issued by the Dispatch Oven Company, Minneapolis, Minn. The new Dispatch heaters, oil or gas fired, can be used on all types of ovens and dryers. One of the features is the use of heavy chromium nickel alloy plates, which provide complete protection for the sheet metal tubes, which are vertical and practically self cleaning.

Gearflex flexible couplings are described in a new 44-page catalogue, No. 443, issued by the Farrel-Birmingham Company, Inc., Ansonia, Conn. The function of a flexible coupling and how Farrel gearflex couplings compensate for misalignment are described, with applications, ratings, dimensions and weights of various types of couplings manufactured by the company. Copies of the booklet may be obtained from the Farrel-Birmingham Company, Inc., 344 Vulcan street, Buffalo, N. Y.

Now Bell Fibre Products Co.

MARION, Ind., January 22, 1940—Authorization to change the name of the Indiana Fibre Products Company, in South Marion, to the Bell Fibre Products Company, has been received from the secretary of state by officers of the company. Manufacture of paper boxes and containers will be continued at the factory, which is located in South Marion. Officers of the company are George A. Bell, Alice McCulloch Bell and John L. Bell.

To Present Brown Plan to Court

BOSTON, Mass., January 22, 1940—It is understood here that the reorganization plan of Brown Company, which has had the approval of all interested groups, will be presented in Federal Court at Portland, Me., either this week or next.

While the terms are not officially available, they are understood to conform closely to previous forecasts. The $21,415,000 of 5½ per cent bonds will, it is said, receive $600 per $1000 in general mortgage bonds plus 6½ shares of $100 convertible preferred stock and 28 shares of common stock. The 100,000 shares of preferred will be exchanged at the rate of 12½ shares of new common stock for each present share. The common stock, it is believed, will be given new common stock on a basis not immediately ascertainable, plus warrants to purchase additional shares of common. It is probable that there will be 2,000,000 shares of the new no par common stock outstanding, with necessary provision for conversion rights of the preferred stock.

It is further understood that the pending $10,000,000 R F C loan to the Brown Company will be made available to the borrower immediately after the plan has received the necessary approval. The loan will have a 15-year maturity, bear interest at the rate of 5 per cent and is subject to a rate of amortization that should retire the major portion of it before maturity.

Uses for Tensilized Pliofilm

Experimental machines at The Goodyear Tire and Rubber Company currently are engaged in converting continuous ribbons of Pliofilm into threads, or cords. These in turn are being woven into some very interesting fabrics. Cords may be fabricated in varying thicknesses, depending upon the width of ribbon used for the purpose. The resulting woven fabrics are correspondingly fine or coarse, as desired. The woven material is extremely tough and resistant to tearing across either warp or woof. Used experimentally as clothing, the fabric proved cool, well ventilated.

Used as a rug or floor mat, coarsely woven, the Tensilized fabric proved quite rugged and resistant to wear, also washed easily.

Like in all other applications of Pliofilm and its derivative products, there is no limit to the color combinations that can be worked out in fabrics and some striking effects have resulted through application of the weavers' art to the rainbow of colors available.

Numerous other applications are being investigated, but it is probable that one of the first markets to be tested will be the deluxe gift wrapping field. Popularity of Plio-Ribbon is an illustration of favorable consumer reaction to the introduction of new and improved package wraps.

Powell River to Build Laboratory

VANCOUVER, B. C., January 20, 1940—With a view to providing facilities for more extensive research work the Powell River Co. Ltd. has instructed architects to draft plans for new laboratories at Powell River, B. C. The new building will be 85 by fifty feet and will be of cedar siding finish and frame construction on concrete foundations. It will house laboratories and offices for the research division of the big newsprint and pulp company.

New York Paper and Pulp Market Review

Business Prospects Continue Favorable Despite Seasonal Slackening In Demand—Paper and Board Production Continues High — Pulp Prices Firm With Unbleached Sulphite Scarce — Waste Paper Prices Firm.

Office of the PAPER TRADE JOURNAL.
Wednesday, January 24, 1940.

Wholesale paper sales are about up to general trade expectations for the period, which is normally relatively quiet. From reports received from many manufacturers' representatives, jobbers, and general paper merchants during the current week, business prospects appear excellent for the near future. From many quarters in the trade comment is heard that volume will be higher when the reports are received for the final week of the current month.

The index of general business activity declined to 105.0 per cent for the week ended January 13, from 105.9 per cent for the preceding week, compared with 90.6 per cent for the corresponding week in 1939.

Paper production of 182 mills for the week ended January 13 was estimated at 87.8 per cent, compared with 80.3 per cent in 1939, with 59.7 per cent in 1938, with 90.2 per cent in 1937, and with 77.1 per cent for the corresponding week in 1936. Yearly average production of paper for the past five years was as follows: 1939, 84.0 per cent; 1938, 72.3 per cent; 1937, 80.6 per cent; 1936, 81.3 per cent, and 1935, 70.5 per cent.

Paper board production for the week ended January 13 was 74.0 per cent, compared with 62.0 per cent in 1939, with 52.0 per cent in 1938, with 79.0 per cent in 1937, and with 64.0 per cent for the corresponding week in 1936.

No important change in the newsprint market has been reported this week. According to latest reports, daily newspaper circulation declined 1,244,718 during 1939 to 39,434,382. The decline in daily papers totaled 43 and there was a net increase of 127 in the combined total of weekly, semi-weekly and tri-weekly papers.

Sales volume in many kinds of paper and paper products is reported to be well maintained at a good level for this period of the year. Improvement in demand is expected in the trade to show itself in the last week of the current month. Prices on all grades of paper **are firm with the trend** reported as upward. Backlogs of orders which piled up in the last quarter of last year are fast disappearing in some lines. The most active product at this date is reported in kraft liner board. No important price changes in paper or paper board have been reported to date.

Mechanical Pulp

No important change has been reported in the mechanical pulp market this week. Prices are firm and unchanged.

Chemical Pulp

The chemical pulp market is unchanged for the current week. Prices on all grades of pulp are very firm. Unbleached sulphite pulp continues to be reported scarce. No important change from prevailing market quotations has occurred to date.

Rags

Trading in new and old domestic rags is reported as rather quiet this week. No important change from prevailing representative market quotations has been reported.

Old Rope and Bagging

The old rope market is strong under the influence of a reported limited supply and a steady demand. Supplies from abroad are reported as declining and higher prices are looked for in several quarters of the trade. No price changes were reported to date.

Prices on old bagging are firmer this week and the price trend is reported upward. No change from prevailing market quotations has been reported to date.

Old Waste Paper

The paper stock market is reported firm. No change from prevailing representative market quotations has occurred to date, despite the reported $2.50 per ton reduction in the price of mixed paper in the Chicago market. Inquiries for export continue active on mixed paper.

Twine

No important change in the twine market has been reported this week. Prices are firm and the business prospect is generally considered as favorable.

Paper Men Paid Over $75,000

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., January 24, 1940—Secretary of the Treasury Morgenthau has made public a list of individuals receiving compensation for personal services from corporations in excess of $75,000 for the calendar year 1938 or the fiscal year ending in 1939. This action is in accordance with a new provision of the Internal Revenue Code.

Among paper men listed are: Union Bag and Paper Corporation; Alexander Calder, salary, $60,000, bonus, $17,189.19, other compensation, $330, total, $77,519.19; the Hinde & Dauch Paper Company; Sidney Frohman, salary, $50,000, bonus, $42,430, total $92,430; Pollock Paper and Box Company: Leslie L. Jacobs, salary, $40,000, bonus, $45,251.71; total, $85,251.71; and Kimberly-Clark Corporation: F. J. Sensenbrenner, salary, $75,735, total, $75,735.

Albia Box Co. Elects Officers

[FROM OUR REGULAR CORRESPONDENT]

TROY, N. Y., January 22, 1940—The annual meeting of the Albia Box and Paper Company was held this week when officers and directors for the year were chosen. The new board of directors will include William C. Geer, Olive Kley, William D. Mahoney, Robert H. McCarthy, L. W. Houston, C. H. Gardner and J. L. Snyder. The officers reelected will include William C. Geer, president; J. Leslie Snyder, vice-president and general manager; C. H. Gardner, treasurer, and Robert H. McCarthy, secretary.

MISCELLANEOUS MARKETS

Office of the PAPER TRADE JOURNAL,
Wednesday, January 24, 1940.

BLANC FIXE—Quotations on blanc fixe are reported firm under a moderately good demand. The pulp is currently quoted at $32 per ton, in barrels, at works; the powder is quoted at $47.50 per ton, in bags, at works.

BLEACHING POWDER—Prices on bleaching powder are firm under a moderately good demand and unchanged at prevailing market quotations. Bleaching powder is currently quoted at $2 per 100 pounds, in drums, at works.

CASEIN—Quotations on casein are a little higher for the current week. Standard domestic casein, 20-30 mesh, is currently quoted at 16 cents per pound; 80-100 mesh, at 16½ cents per pound; all prices in bags, car lots. Argentina casein, 20-30 mesh is quoted at 14 cents per pound. The quotation of 14 cents per pound on French casein is nominal.

CAUSTIC SODA—Prices on caustic soda are firm under a moderately good demand. Solid caustic soda is currently quoted at $2.30 per 100 pounds; flake and ground at $2.70 per 100 pounds, in drums, at works.

CHINA CLAY—Quotations on china clay are reported firm and unchanged. Domestic filler clay is currently quoted at from $7 to $15 per ton; coating clay at from $11 to $22 per ton, at mines. Imported clay is quoted at from $13.50 to $25 per ton, ship side.

CHLORINE—Prices on chlorine are firm under a moderately active demand and continue unchanged at prevailing market levels. Chlorine is currently quoted at $1.75 per 100 pounds, in single-unit tank cars, f.o.b., works.

ROSIN—The rosin market is reported firm for the current week, with prices on some grades a little higher. "G" gum rosin is currently quoted at $5.30 per 280 pounds, gross weight, in barrels, Savannah. "FF" wood rosin is quoted at $5.15 per 280 pounds, gross weight, in barrels, New York. Seventy per cent gum rosin size is offered at $2.84 per 100 pounds, f.o.b., shipping point.

SALT CAKE—Prices on salt cake continue firm under a good demand and are practically nominal. Domestic salt cake is currently quoted at $17 per ton, in bulk; chrome salt cake at $16 per ton. All prices in car lots, f.o.b., shipping point. The price of $20 per ton on imported salt cake is nominal.

SODA ASH—Quotations on soda ash are firm and continue unchanged at prevailing market prices. Quotations on soda ash in car lots, per 100 pounds, are as follows: in bulk, $.90; in paper bags, $1.05; and in barrels, $1.35.

STARCH—Prices on corn starch are reported unchanged for this week. Globe pearl is currently quoted at $2.50 per 100 pounds; special paper starch at $2.60 per 100 pounds; all prices in bags, car lots, f.o.b., Chicago.

SULPHATE OF ALUMINA—Quotations on sulphate of alumina are firm and unchanged at prevailing market prices. The commercial grades are currently quoted at $1.15 per 100 pounds; iron free at $1.45 per 100 pounds, in bags, car lots, f.o.b., works.

SULPHUR—Prices on sulphur are firm and continue unchanged at prevailing market prices. Annual contracts are quoted at $16 per long ton, f.o.b., mines. Spot and nearby car lots are offered at $19 per ton.

TALC—Quotations on talc are reported firm and unchanged at prevailing market levels. Domestic talc is currently quoted at from $15 to $18 per ton, Eastern mines. Imported talc is quoted at from $23 to $45 per ton.

MARKET QUOTATIONS

Paper

(Delivered New York)

News, per ton—			
Roll, contract	$50.00	@	—
Sheets	58.00	"	—
Kraft—per cwt.—Delivered Zone A			
Northern, Extra Quality	$5.00	@	$5.50
Superstandard	4.62½	"	5.00
Northern Standard Wrapping	4.25	"	4.62½
Standard Wrapping	4.00	"	—
Tissues—Per Ream—Carlots			
White No. 1	.92½	@	—
White No. 1 M. G.	.90	"	—
White No. 1½	.70	"	—
White No. 2	.65	"	—
Anti-Tarnish M. G.	.80	"	—
Colored	.87½	"	—
Kraft	.80	"	—
Manila	.65	"	—
Unbl. Toilet, 1 M.	3.50	"	—
Bleached Toilet	5.26	"	—
Paper Towels, Per Case—			
Unbleached, Jr.	1.95	@	—
Bleached, Jr.	3.20	"	—
Manila—per cwt.—C. l. f. a.			
No. 1 Jute	8.25	@	10.25
No. 1 Manila Wrapping, 35 lb.	5.25	"	—
No. 2 Manila Wrapping, 35 lb.	5.00	"	—
Boards, per ton—			
News	45.00	@	—
Chip	45.00	"	—
Sgl. Mla. Lt. Chip	57.50	"	—
Jute Lined Chip	57.50	"	—
White Pat. Coated	70.00	"	—
Kraft Liners	55.00	"	—
Binders Boards	76.00	"	87.00

The following are representative of distributors' resale prices:

Rag Content Bonds and Ledgers—
White, Assorted Items,
Delivered in Zone 1:

	Bonds	Ledgers
100% Rag Ext. No. 1	$39.10@$46.00	$40.25@$47.25
100% Rag	31.05 " 36.50	32.20 " 37.75
85% Rag	.... "	29.90 " 35.00
75% Rag	23.60 " 27.75	24.75 " 29.00
65% Rag	.... "	21.65 " 26.25
50% Rag	17.55 " 21.50	18.70 " 22.75
25% Rag	14.65 " 17.75	15.80 " 19.25

Colors at $1.00 cwt. extra.

Sulphite Bonds and Ledgers—
White, Assorted Items,
Delivered in Zone 1:

	Bonds	Ledgers
No. 1	$8.95@$11.00	$10.10@$12.25
No. 2	8.05 " 9.75	9.25 " 11.25
No. 3	7.60 " 9.25	8.50 " 10.75
No. 4	7.30 " 9.00	8.50 " 10.25

Colors $1.00 cwt. extra.

Free Sheet Book Papers—
White, Cased Paper,
Delivered in Zone 1:

No. 1 Glossy Coated	$11.90	@	$13.50
No. 2 Glossy Coated	10.35	"	11.75
No. 3 Glossy Coated	9.55	"	11.00
No. 4 Glossy Coated	9.15	"	10.50
No. 1 Antique (watermarked)	8.35	"	9.50
No. 2 Offset	7.70	"	9.00
A Grade E. F.	7.50	"	8.75
A Grade S. & S. C.	7.75	"	9.00
B Grade E. F.	6.95	"	8.00
B Grade S. & S. C.	7.20	"	8.25
C Grade E. F.	6.65	"	7.75
C Grade S. & S. C.	6.90	"	8.00
D Grade E. F.	6.40	"	7.50
D Grade S. & S. C.	6.65	"	7.75

Ivory & India at $.50 cwt. extra.

Mechanical Pulp

(On Dock, Atlantic Ports)

No. 1 Imported—			
Moist	$35.00	@	40.00
Dry	37.50	"	42.50
(Delivered)			
No. 1 Domestic and Canadian	40.00	@	42.00

Chemical Pulp

(On Dock, Atlantic, Gulf and West Coast Ports)

Bleached Sulphite (Domestic and Foreign)—			
Prime Bleached Sulphite	3.00	@	3.25
Prime Qualities—			
Easy-Bleaching Sulphite	2.75	"	2.85
Strong Unbleached Sulphite	2.75	"	2.80
(On Dock, Atlantic Ports)			
Kraft Bleached	3.00	@	3.50
Kraft Light & Strong	2.50	"	2.65
Kraft No. 1	2.40	"	2.55
(F. o. b. Pulp Mill)			
Kraft Domestic	1.80	"	2.12½
(Delivered)			
Soda Bleached	2.90	"	—

Add 60 cents per short ton, dock charges for Albany; $2.50 for Lake Ports East and $3.50 for Lake Ports West of Mackinac Straits.

Domestic Rags

New Rags

(Prices to Mill f. o. b. N. Y.)

Shirt Cuttings—			
New White, No. 1.	7.50	@	7.75
Silesias No. 1	4.50	"	4.75
New Unbleached	7.50	"	7.75
Blue Overall	5.00	"	5.25
Fancy	2.25	"	2.50
Washables	2.00	"	2.15
Mixed Khaki Cuttings	2.75	"	3.00
O. D. Khaki Cuttings	3.25	"	3.50

Old Rags

White, No. 1—			
Repacked	3.25	"	3.50
Miscellaneous	2.75	"	3.00
White, No. 2—			
Repacked	2.50	"	2.75
Miscellaneous	2.00	"	2.25
Thirds and Blues—			
Repacked	2.00	"	2.25
Miscellaneous	1.75	"	1.90
Roofing Rags—			
No. 1	1.50	"	1.55
No. 2	1.20	"	1.27½
No. 3 (bagging)	1.50	"	1.60
No. 4	.60	"	.65
No. 5A	.60	"	.65

Foreign Rags

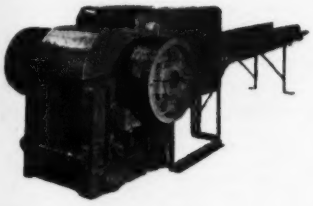
All prices nominal.

New Rags

New Dark Cuttings	2.25	@	2.40
New Mixed Cuttings	2.00	"	2.20
New Light Silesias	5.50	"	5.75
Light Flannelettes	5.50	"	5.75
New White Cuttings	7.00	"	7.50
New Light Oxford	4.00	"	4.50
New Light Prints	3.00	"	3.25

Old Rags

No. 1 White Linens	7.50	"	8.50
No. 2 White Linens	6.50	"	7.50
No. 3 White Linens	4.50	"	—



NO. 11 "GIANT" MULTIPLEX HEAVY DUTY RAG CUTTER

with a capacity of 3 to 4 tons of rags an hour, meets the needs of large producers of fine papers. This cutter has every modern feature for efficient, low cost operation, over many years of service.

One of a series of fine cutting machines that meet every quantity requirement.

Write for full description and prices

TAYLOR-STILES & COMPANY

10 BRIDGE STREET RIEGELSVILLE, N. J.

SCREENS for PAPER and PULP MILLS

PERFORMANCE of your Centrifugals, Shakers and Drainers definitely improved by the use of precision screens built to your specifications. Let us "sit in" on your screening problems.

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EXCELSIOR KNOX Woolen Co. Camden, Me. FELTS & JACKETS

BUT also a guarantee by men who for 75 years have prided themselves in making finer felts. TO YOU —this is the mark of dependability, longer felt life and greater saving.

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INDUSTRIAL TYCOL OILS-GREASES

A COMPLETE LINE OF TYCOL LUBRICANTS SCIENTIFICALLY ENGINEERED FOR EVERY INDUSTRIAL USE

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★ Dryer Drainage System—Syphon Installator—Weight and Consistency Regulator.

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APPLETON wires are good wires

PULP MILL MACH'Y FINISHING ROOM MACH'Y
— FRICTION CLUTCHES —

The MOORE & WHITE CO.
PHILADELPHIA, PA.
N. PHILA. STA. PENNA. R.R.
PAPER MILL MACHINERY

No. 4 White Linens.	2.25	@	3.25
No. 1 White Cotton.	4.25	"	4.75
No. 2 White Cotton.	3.25	"	3.75
No. 3 White Cotton.	2.50	"	3.00
No. 4 White Cotton.	1.90	"	2.20
Extra Light Prints..	2.00	"	2.40
Ord. Light Prints...	1.75	"	2.15
Med. Light Prints...	1.55	"	1.95
Dutch Blue Cottons.	2.25	"	2.50
French Blue Linens..	3.00	"	—
Checks and Blues...	2.00	"	—
Linsey Garments....	1.90	"	2.00
Dark Cottons.....	1.50	"	1.60
Old Shopperies.....	1.30	"	1.45
New Shopperies.....	1.45	"	1.50
French Blues.....	2.25	"	2.50

Old Rope and Bagging

(Prices to Mill, f. o. b. N. Y.)

Gunny No. 1—			
Foreign	2.50	@	2.75
Domestic	2.25	"	2.50
Wool Tares, light...	1.75	"	2.00
Wool Tares, heavy..	1.80	"	1.90
Bright Bagging.....	2.25	"	2.50
Manila Rope—			
Foreign	4.25	"	4.50
Domestic	4.25	"	4.50
Jute Threads.....	3.00	"	3.25
Sisal Strings.....	2.00	"	2.25
Mixed Strings.....	.70	"	.85

Old Waste Papers

(F. o. b. New York)

Shavings—			
White Envelope Cuttings	3.10	@	3.25
Ordinary Hard White No. 1....	2.25	@	2.50
Soft White No. 1..	1.80	"	1.90
Soft White Extra..	2.50	"	2.60
Flat Stock—			
Stitchless	1.10	"	1.25
Overissue Mag....	1.00	"	1.10
Solid Flat Book....	.80	"	.90
Crumbled No. 1...	.70	"	.75
Ledger White Stock	1.50	"	1.60
Ledger Stock Colored	1.05	"	1.15
Manila—			
New Env. Cut....	1.70	"	1.80
New Cuttings.....	1.40	"	1.50
Old Kraft Machine— Compressed bales..	1.00	"	1.10
News—			
No. 1 White News	1.75	"	1.90
Strictly Overissue.	.70	"	.75
Strictly Folded....	.47½	"	.52½
Corrugated	.60	"	.65
No. 1 Mixed Paper..	.27½	"	.32½

Twines

(F. o. b. Mill)

(Soft Fiber)

Coarse Polished—			
India	.18½	@	—
White Hemp.....	.18½	"	—
Fine Polished—			
Fine India.....	.23	"	—
Unpolished—			
Box	.14¾	"	—
Paper Makers.....	.15	"	—
Tube Rope.....	.16¼	"	—
Wall Paper.....	.15¾	"	—
Wrapping	.18	"	—
Soft Fiber Rope...	.16¼	"	—
Cotton	.21	"	—

(Hard Fiber)

Medium Java.....	.19	"	—
Mex. Sisal.....	.16	"	—
Manila	.24	"	—

PHILADELPHIA

Domestic Rags (New)

(Price to Mill, f.o.b. Phila.)

Shirt Cuttings—			
New White No. 1.	.07¼	@	.07½
New White No. 2.	.04	"	.04½
Light Silesias....	—	"	.04½
Silesias, No. 1....	—	"	.04½
Black Silesias, soft	—	"	.03¾
New Unbleached..	.05½	"	.06
Washable, No. 1..	—	"	.04
Blue Overall.....	—	"	.05
Cottons—According to grades—			
Washable No. 2...	—	"	.02
New Blue	—	"	.02
Fancy Percales....	—	"	.03
New Black Soft...	—	"	.04
New Light Seconds	.04½	"	.05
New Dark Seconds	—	"	1.55
Khaki Cuttings—			
No. 1 O. D.....	.03½	"	.04
No. 2 Mixed.....	.03	"	.03¼
Corduroy	—	"	.02½
New Canvas.....	.05½	"	.06
New Black Mixed.	—	"	.03

Domestic Rags (Old)

White No. 1—			
Repacked	3.25	@	3.75
Miscellaneous	2.75	"	3.00
Thirds and Blues—			
Miscellaneous	2.00	"	2.25
Repacked	2.50	"	2.75
Black Stockings (Export)	3.50	"	4.00
Roofing Stock—			
Foreign No. 1....Nominal			
Domestic No. 1..	1.50	"	1.60
Domestic No. 2...	1.35	"	1.45
Roofing Bagging..	—	"	1.30

Bagging

(f.o.b. Phila.)

Gunny, No. 1—			
Foreign .....Nominal			
Domestic	2.50	@	3.00
Manila Rope.....	3.25	"	3.75
Sisal Rope.....	1.75	"	2.00
Mixed Rope.....	1.25	"	1.50
Scrap—			
No. 1.....	2.00	"	2.50
No. 2.....	—	"	1.30
Wool Tares, heavy..	3.50	"	3.70
Mixed Strings	.75	"	1.00
No. 1 New Light Burlap	3.00	"	3.50
New Burlap Cuttings	2.00	"	2.25

Old Papers

(f.o.b. Phila.)

Shavings—			
No. 1 Hard Write	2.25	@	2.30
No 2 Hard White	2.00	"	2.10
No. 1 Soft White	1.85	"	1.90
No. 2 Soft White	1.50	"	1.60
No. 1 Mixed.....	.90	"	1.00
Solid Ledger Stock..	1.50	"	1.60
Ledger Stock, white.	1.40	"	1.45
Ledger Stock, colored	1.10	"	1.20
No. 1 Books, heavy..	.90	"	.95
Manila Cuttings.....	1.75	"	1.80
Print Manila.....	.60	"	.70
Container Manila....	.50	"	.60
Kraft Paper.....	1.00	"	1.10
No. 1 Mixed Paper..	.40	"	.45
Straw Board Chip...	—	"	.40
Binders Board Chip..	.40	"	—
Corrugated Board...	.60	"	.65
Overissue News.....	.70	"	.75
Old Newspapers.....	.50	"	.55

BOSTON

Old Papers

(f.o.b. Boston)

Shavings—			
No. 1 Hard White	2.25	@	2.50
No. 1 Soft White	1.85	"	2.15
No. 2 Mixed.....	.75	"	.80
Solid Ledger Books..	1.30	"	—
Overissue Ledger Stock	1.30	"	1.50
Mixed Ledgers.....	.85	"	.90
No. 1 Books, heavy..	1.00	"	1.10
No. 1 Books, light..	.65	"	.75
Crumpled Stitchless Book Stock.....	.55	"	.65
Manila Env. Cuttings	1.70	"	1.85
Manila Envelope Cuttings, extra quality	2.35	"	2.60
White Blank News..	1.40	@	1.50
No. 1 Kraft.....	1.10	"	1.20
Mixed Papers	.30	"	.32½
Print Manila.....	.65	"	.70
Container Manila...	.60	"	.70
Old Newspapers....	.60	"	.65
Paper Wool Strings	.80	"	.90
Overissue News.....	.70	"	.75
Box Board Chips....	.50	"	.52½
Corrugated Boxes....	.50	"	.60
Kraft corrugated boxes	1.05	"	1.10
Screening Wrappers	.60	"	.70

Bagging

(f.o.b. Boston)

Manila Rope—			
Foreign	4.25	@	4.50
Domestic	4.00	@	4.50
Sisal Rope	2.25	"	2.50
Mixed Rope	.75	"	1.00
Transmission Rope ..	3.00	"	—
Soft Jute Ropes.....	3.00	"	3.50
Jute Carpet Threads.	1.25	"	1.50
Gunny Bagging—			
Foreign	3.00	@	—
Domestic	2.45	"	2.50
Bleachery Burlap....	3.50	"	3.75
Scrap Burlap—			
Foreign	2.40	"	2.50
Domestic	1.90	"	2.00
Scrap Sisal.....	2.25	"	2.50
Scrap Sisal for Shredding	2.50	"	2.75
Wool Tares, Heavy..	2.50	"	2.60
New Burlap Cuttings	3.25	"	3.50
Aust. Wool Pouches.	3.25	"	3.50
Heavy baling bagging	2.65	"	2.75
Paper Mill Bagging..	1.25	"	1.50
No. 2 Bagging	1.10	"	1.25

Domestic Rags (New)

(F. o. b. Boston)

Shirt Cuttings—			
New Light Prints...	.03¼	@	.03½
New White No. 1...	.08	"	.08¼
New Light Flannelettes	.05	"	—
Silesias No. 1	.05	"	—
New Black Silesias..	.03½	"	.03¾
Soft Unbleached....	7.50	"	8.00
Blue Cheviots	.05½	"	.06
Fancy	.02	"	.02½
Washable	.02	"	.02½
Cottons—According to grades—			
Blue Overalls	.05¼	"	.05½
New Black, soft ..	.03¾	@	.04
Khaki Cuttings	.02½	"	.03
O. D. Khaki	03	"	.03¼
Corduroy	.02¾	"	.03
New Canvas.....	.06¾	"	.07¼
B. V. D. Cuttings...	.07	"	.07½

Domestic Rags (Old)

(F. o.b. Boston)

Canvas	.04¼	@	—
White No. 1—			
Repacked	—	"	2.75
Miscellaneous	2.50	"	2.75
White No. 2—			
Repacked	1.90	"	2.00
Miscellaneous	2.00	"	2.25
Twos and Blues	2.25	"	2.50
Old Blue Overalls ..	1.60	"	2.00
Thirds and Blues—			
Repacked	2.00	"	2.25
Miscellaneous	1.50	"	1.60
Black Stockings	4.00	"	4.25
Roofing Stock—			
No. 1.....	1.75	"	2.00
No. 2.....	1.60	"	1.65
No. 3.....	1.00	"	1.25

Foreign Rags

(F. o. b. Boston)

Dark Cottons.....(nominal)	
Dutch Blues.....(nominal)	
New Checks and Blues(nominal)	
Old Fustians.....(nominal)	
Old Linsey Garments.(nominal)	
New Silesias.....(nominal)	

TORONTO

Paper

Bonds

Direct mill shipment in two-ton lots.			
No. 1 White $36.50		@	—
No. 1 Tints	37.50	"	—
No. 2 White	26.50	"	—
No. 2 Tints	27.50	"	—
No. 2 Golden Rod..	28.50	"	—
No. 3 White	22.00	"	—
No. 4 White	15.50	"	—
No. 4 Tints	16.50	"	—
No. 4 Golden Rod..	17.50	"	—
Direct mill shipment in three-ton lots.			
No. 5 White $10.40		@	—
No. 5 Tints	11.40	"	—
No. 5 Golden Rod..	12.40	"	—
No. 6 White	9.40	"	—
No. 6 Tints	9.90	"	—
No. 6 Golden Rod..	11.40	"	—
No. 7 White	8.40	"	—
No. 7 Tints	8.90	"	—
No. 7 Golden Rod..	10.40	"	—
Book—			
No. 1 M. F.	$7.75	"	—
No. 2 M. F.	7.25	"	—
No. 3 M. F.	6.60	"	—
No. 1 S. C.	8.25	"	—
No. 2 S. C.	7.75	"	—
No. 3 S. C.	6.25	"	—

Coated Book & Litho

Ton Lots (resale)

No. 1 .....$12.15		@	—
No. 2	10.50	"	—
No. 3	9.45	"	—
Coated tinted.....	13.20	"	—
Golden Rod.....	14.80	"	—
Wrapping—delivered—			
Rag Brown.....	4.85	"	5.25
White Wrap.....	4.00	"	—
"B" Manila.....	4.90	"	6.15
No. 1 Manila....	$5.50	@	$6.90
Fiber	5.50	"	6.90
Kraft No. 2.....	5.50	"	6.90

(f.o.b. Cars, Toronto)

News per ton—			
Rolls (contract)..	46.00	"	—
Sheets	54.00	"	—

Pulp

Ground wood.....$36.50		@	—
Unbleached sulphite.	54.00	"	—
Bleached sulphite...	64.00	"	—
Kraft	47.50	"	—
Soda	58.00	"	—

Old Waste Paper

(In carload lots, f.o.b. Toronto)

Shavings—			
White Env. Cut..	2.15	@	—
Soft White.....	2.00	"	2.15
White Blk. News..	1.35	"	1.50
Book and Ledger—			
Flat Magazine and Book Stock (old)	.90	"	1.00
Light and Crumpled Book Stock.....	.80	"	.90
Ledgers and Writings	1.15	"	—
Manilas—			
New Manila Cut..	1.55	"	1.60
Printed Manilas...	.70	"	—
Kraft	1.15	"	—
News and Scrap—			
Strictly Overissue	.75	"	—
Strictly Folded ..	.70	"	—
No. 1 Mixed Paper	.60	"	—

CHICAGO

Waste Paper

(f.o.b. Chicago)

Shavings—			
No. 1 White Envelope cuttings..	2.40	@	—
No. 1 Hard White	2.23	"	—
No. 1 Soft White	2.00	"	—
Ledger and Writings	1.20	"	—
Solid Books.....	.95	"	—
Blanks	1.70	"	—
Krafts	1.00	"	—
New Kraft Cuts.....	1.60	"	—
Overissue News.....	.80	"	—
Old Newspapers—			
No. 1 Folded News	.73	"	—
No. 1 Mixed Paper	.63	"	—
Roofing Stocks—			
No. 1	1.25	@	—
No. 2	1.15	"	—